Doc No. 1723-PS-0013
Issue 1

GILL INSTRUMENTS

User Manual

MetPak RG
Weather Station

MetPak RG Part: 1723-3B-2-111

Foreword

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Thank you for purchasing the MetPak RG manufactured by Gill Instruments Ltd. To achieve optimum performance we recommend that you read the whole of this manual before proceeding with use.

Gill products are in continuous development and therefore specifications may be subject to change and design improvements without prior notice.

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Guarantee

For terms of guarantee, please contact your supplier.

Warranty is void if the coloured Wind Sensor security seal is damaged or broken, or the Wind Sensor transducer caps have been damaged.

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Cautions and Notes

The following symbols are used in this guide:

CAUTION. This indicates an important operating instruction that should be followed to avoid any potential damage to hardware or property, loss of data, or personal injury.

NOTE. This indicates important information to help you make the best use of this product.

Applicable Parts

MetPak RG Part 1723-3B-2-111

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1. Introduction

MetPak RG is a compact and lightweight multi-sensor instrument that measures the most essential weather parameters. Gill ultrasonic technology, as used in the proven WindSonic instrument, measures wind speed and direction. Temperature and Humidity are measured and Dewpoint calculated using an industry standard probe housed in a naturally aspirated radiation shield. Barometric pressure is measured using an industry standard sensor.

The customer is able to add one supplied digital contact closure rain gauge.

The MetPak RG combines all the instrument data into a single combined data string. This may be configured for digital ASCII RS232/RS422/RS485 (2 wire point to point) and digital SDI-12 outputs.

The instrument uses a rugged mounting clamp that attaches to any vertical pipe up to 58mm (2.3 inch) diameter.

An electrical Hub box is fitted to the mounting bracket for termination of the Rain Gauge Cable and Power/Data cable.

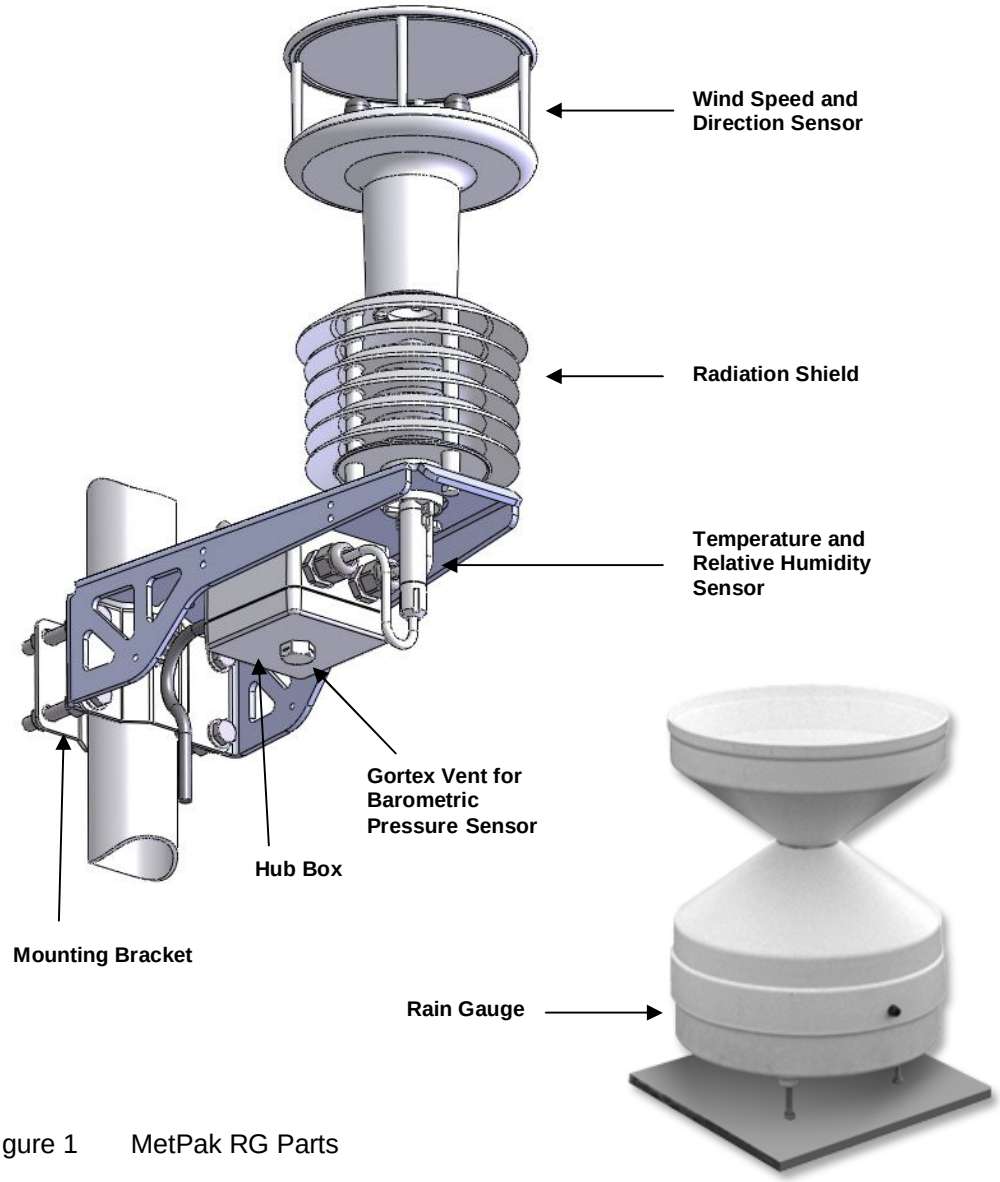

Figure 1 MetPak RG Parts

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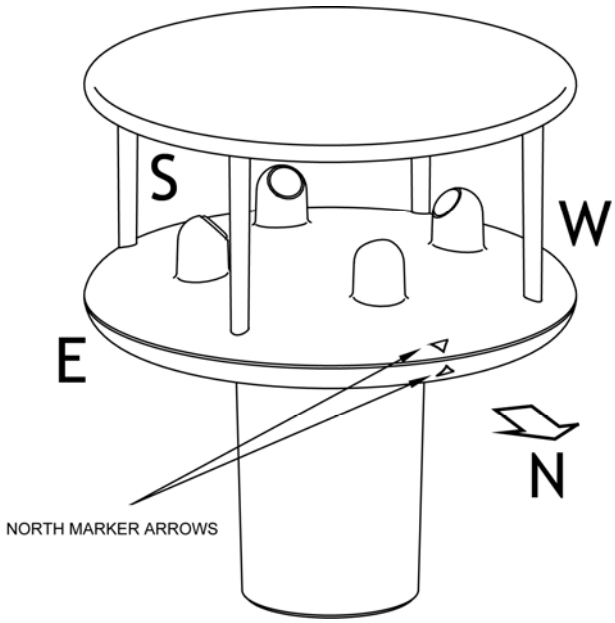
1.1 Principle of Operation

1.1.1 Wind Speed and Direction Sensor

The MetPak RG uses the WindSonic wind speed and direction sensor. The WindSonic measures the times taken for an ultrasonic pulse of sound to travel from the North transducer to the South transducer, and compares it with the time for a pulse to travel from S to N transducer. Likewise times are compared between West and East, and E and W transducer.

If, for example, a North wind is blowing, then the time taken for the pulse to travel from N to S will be faster than from S to N, whereas the W to E, and E to W times will be the same. The wind speed and direction can then be calculated from the differences in the times of flight on each axis. This calculation is independent of factors such as temperature.



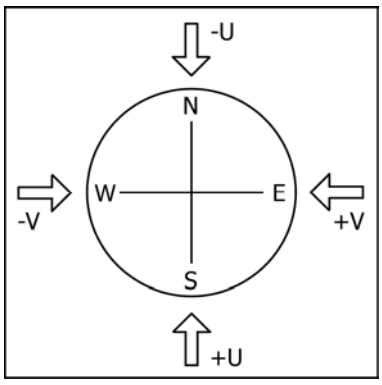


Figure 2 Compass points

Figure 2 shows the compass point and polarity of U and V if the wind components along the U and V axis are blowing in the direction of the respective arrows.

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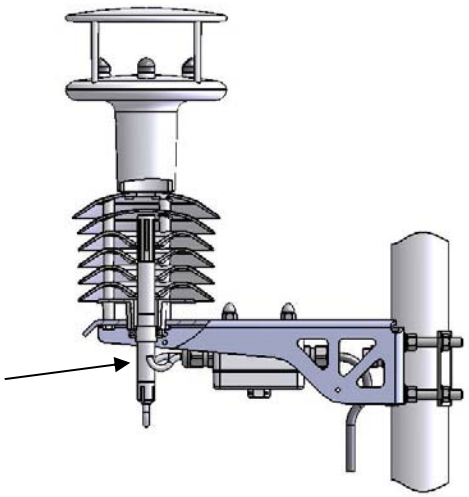
1.1.2 Radiation Shield

The Multi-Plate Radiation Shield protects temperature and relative humidity sensors from error-producing solar radiation and rain. This shield relies on a combination of plate geometry, material and natural ventilation to provide effective shielding.

1.1.3 Temperature and Relative Humidity Sensor with Dewpoint Output

The Rotronic HygroClip module is a complete instrument, with integrated temperature compensation. Calibration data is maintained within the integrated electronics. It provides digital output signals for Relative Humidity, Temperature and Dewpoint to the MetPak RG Hub box.



Position of Temperature and Relative Humidity Probe in the Radiation Shield.

1.1.4 Barometric Pressure

Barometric pressure output is provided by a solid-state device fitted on to the circuit board in the MetPak RG Hub box. Vent to atmosphere is via a Gortex filter which also protects the pressure sensor from the effects of wind and rain.

1.1.5 Rain Sensor (DIG1 Input)

Rainfall is measured by the well-proven tipping bucket method. Rain is collected by a funnel and is passed to one of the two buckets situated at either end of a short balance arm. The balance arm tips when the first bucket is full, emptying this bucket and positioning the second bucket under the funnel. The tipping process repeats indefinitely as long as the rain continues to fall, with each tip corresponding to a fixed quantity of rainfall; at each tip the moving arm forces a magnet past a reed switch, causing contact to be made for a few milliseconds.

The Rain Gauge is connected to the MetPak RG Digital input, which detects when two dedicated terminals are short circuited (less than 1k ohm).

1.2 Abbreviations

Table 1 Abbreviations

Item	Meaning
ASCII	American Standard Code for Information Interchange
C	Centigrade
CAL	Calibration
CD	Compact Disc
COM	Communications
CR	Carriage Return
CSV	Comma Separated Variable
ETX	End of String
F	Fahrenheit
FPM	Feet per Minute
HF	High Frequency
HPA	Hecto-Pascals
HTML	Hyper Text Markup Language
Hz	Hertz
IMM	International Maritime Mobile
In Hg	Inches of Mercury
K	Kelvin
KPH	Kilometres per Hour
KTS	Knots
LF	Line Feed
M Bar	Milli Bars
Max	Maximum
MF	Medium Frequency
Min	Minimum
Mm Hg	Millimetres of Mercury
MPH	Miles per Hour
MS	Microsoft
MS	Metres per Second
NSEW	North South East West
NVM	Non-Volatile Memory
PC	IBM compatible Personal Computer
ROM	Read Only Memory
RS232	Communications standard
RS422	Communications standard
Rx	Receive
RXD	Received Data
SDI-12	Serial – Data Interface standard for microprocessor based sensors
STX	Start of String
Tx	Transmit
TXD	Transmitted Data
VHF	Very High Frequency
WMO	World Meteorological Organisation

2. Installation

MetPak RG has been designed to meet and exceed the stringent standards listed in its specification (see Para 6.1).

2.1 Pre-Installation Checks

MetPak RG Wind Sensor and Hub Box.

As with any sophisticated electronics, good engineering practice should be followed to ensure correct operation:

- Ensure the MetPak RG Wind Sensor will not be affected by other equipment operating locally, which may not conform to current standards, e.g. radio/radar transmitters, generators etc.
- Avoid mounting in the plane of any radar scanner – a vertical separation of at least 2m should be achieved.
- When installing MetPak RG near radio transmitting antennas, ensure that the mounting position fulfills the following minimum separations (all round):
  - VHF IMM – 1m
  - MF/HF – 5m
  - Satcom – 5m (avoid likely lines of sight)
- Use cables recommended by Gill (see Para 2.2.3). If cables are cut and re-connected incorrectly (perhaps in a junction box) then EMC performance may be compromised if cable screen integrity is not maintained.
- Avoid earth loops – wire the system in accordance with these installation guidelines.
- Ensure that the power supply operates to the MetPak RG specification (see Para 6.1) at all times.
- Avoid turbulence caused by surrounding structures that will affect the accuracy of the sensors such as trees, masts and buildings. The WMO make the following recommendations. The standard exposure of wind instruments over level open terrain is 10m above the ground. Open terrain is defined as an area where the distance between the sensor and any obstruction is at least 10 times the height of the obstruction.
- Keep away from building exhaust vents, machinery and motors.

Rain Gauge

The site chosen to install the rain gauge will depend in part on the application to which it is being put and in part on the particular circumstances at the site. But if possible site the rain gauge so that the distance between the rain gauge and an obstruction, such as Trees or buildings is at least as great as twice the height of the obstruction. If the application is very specific, such as monitoring a building site, then the siting of the rain gauge is largely prescribed by use.

NOTE:

No two rain gauge designs are ever likely to produce identical results, and identical rain gauge can give slightly different catches even when sited close to each other.

Customers with 2 or more sets of equipment must not swap around rain gauges with MetPaks without using MetSet to change the calibration figure.

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2.2 Installation

2.2.1 Bench System Test

Prior to physically mounting the MetPak RG in its final location, we strongly recommend that a bench system test is carried out to confirm the system is configured correctly, is fully functional and electrically compatible with the selected host system and cabling (preferably utilising the final cable length). The required data format, units, output rate, and other options should also all be set up at this stage.

Note that MetPak RG is supplied with a matching Rain Gauge and its tip calibration factors will have been pre-programmed into the MetPak hub box. If a replacement Rain gauge is used then the Hub box will need re-programming using Gill MetSet Software with the new tip calibration factor (if this has changed).

2.2.2 Bench Test Equipment Required

1723-3B-2-111	MetPak RG set for RS232 communication (factory default setting) and matching Rain Gauge.
1723-10-051	MetPak RG RS232 to USB 1.8M configuration cable with integral 5v power or alternatively use RS232, RS232 converter and separate 5v to 30 dc power supply.
ES-U-1001-A	EasySynch RS232 to USB adaptor or equivalent (if not using Gill part 1723-10-051) or connect directly to an RS232 COM port.

Power Supply 5V to 30Vdc at 100mA if required.

Belden 9503 3 pair communications and power cable (if not using Gill Part 1723-10-051), length as required.

Digital Multimeter capable of measuring resistance and dc volts.

Gill MetSet and MetView Software supplied on the MetPak RG CD or download from. http://www.gill.co.uk/main/software.html

2.2.3 Cabling

MetPak RG has five communication connection options:

- USB (using the 1.8m Gill USB cable, Part No. 1723-10-051).
- RS232
- RS422
- RS485 (two wire point to point).
- SDI-12

MetPak RG has a Rain Gauge Digital Input connection:

- Digital Switch (DIG1)

It is important that the cable is appropriate for the chosen connection option. The following sections describe the recommended types and maximum lengths of cable in each case.

NOTE. A 15-metre, 6-pair cable (wires stripped at each end) suitable for RS232/RS422 or SDI-12 communication is available from Gill Instruments (Part No. 1723-10-053).

Cable Type Data Comms

Wire type: 24AWG

Wire size: 7x32 AWG.

Cable outer diameter: 6-8mm (to match the hub box gland).

For RS422/485 operation the cable should contain twisted pairs screened to match the application.

Cable Type Rain Gauge

Wire type: 22AWG

Wire size: 7x30 AWG.

The cable should contain a twisted pair screened.

NOTE: The Rain Gauge supplied with MetPak RG has a 6 Metre cable connected to it ready to wire into the MetPak RG hub box.

The following table shows an example manufacturers' reference; other manufacturers' equivalents can be used.

Table 2 Recommended Belden cable types

Application	No. of Pairs	Belden Ref.
Rain Gauge Connection	1	8761
SDI-12 or RS485	2	9729
Digital RS232	3	9503
Digital RS422	4	9504

Cable length

The maximum cable length is dependent on the chosen communication method.

The following table shows the maximum cable lengths for the supported communication protocols at the given baud rates, using the recommended cable. If any problems of data corruption etc. are experienced, then a slower baud rate should be used. Alternatively, a higher specification cable can be tried.

Table 3 Maximum cable lengths for supported communication and sensor network

Communication format	Baud rate	Max. cable length
RS232	19200	6.5M
RS422/485	19200	1000M
SDI-12	1200	90M
Digital Switch Input	Not Applicable	Switch contact and cable resistance to be less than 1k ohm

Cabling (unused wires)

Any unused wires in the connecting cables should be connected to ground preferably at the user equipment end.

Cabling protection

The Cable should be secured:

- With cable clamps or equivalent at regular intervals such that the hub box cable gland does not support the cable weight.
- Away from the mounting bolts to prevent chaffing of the cable.

NOTE. Install appropriate strain relief support to the cable. If possible, pass the cable through the mounting pole.

Earthing

To ensure correct operation and for maximum protection from lightning, a separate lightning rod system is recommended to protect the system.

You can also earth the MetPak RG through its mountings or by connecting a grounding cable (minimum of 6mm² copper wire) to a spare MetPak RG metalwork bolt hole. Clean off any paint that might prevent a good connection.

When you connect the communications cable ensure that the screen has a connection to the hub box case.

Routing Cables through the Hub Box Glands

NOTE: The MetPak RG Hub Box cable glands contain spring loaded metal leaves that are designed to make a ground contact with cables that have an overall braid screen. Care is therefore required when inserting and removing cables through the glands to prevent damage to the metal leaves.

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2.2.4 Communication and Power Connections

To connect the MetPak RG Power and Communications cable:

1. Open MetPak RG's hub box by unfastening the four screws.
2. Locate connector J5 (see Figure 3). Carefully pull the connector off its circuit board pins.
3. Strip the cable wires to 8mm.
4. Pass the cable through one of the gland nuts (please refer to the 2nd NOTE on Page 8).
5. Connect your cable as shown in the following diagrams:
   - Gill USB Cable — Figure 5
   - RS232 — Figure 6
   - RS422 — Figure 7
   - RS485 — Figure 8
   - SDI-12 — Figure 9
6. Attach the cable's screen wires to the terminal post (see Figure 3).
7. After connection, securely tighten the gland nut to prevent moisture ingress.

NOTE. Ensure that MetPak RG is configured for the chosen communications method

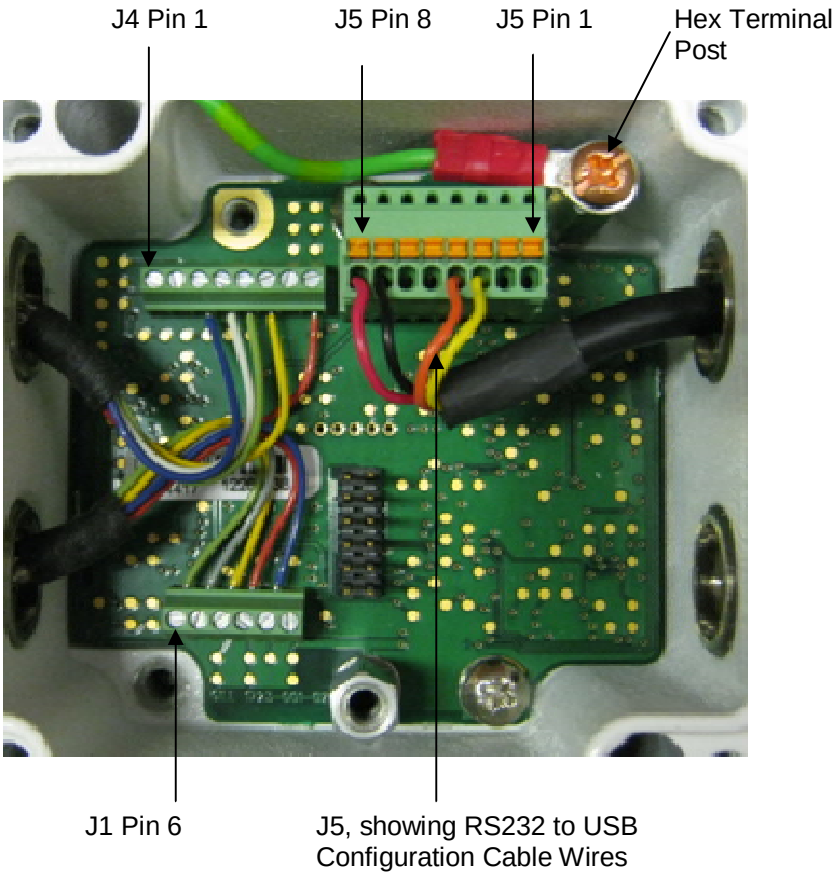

Figure 3 Internal view of the hub box

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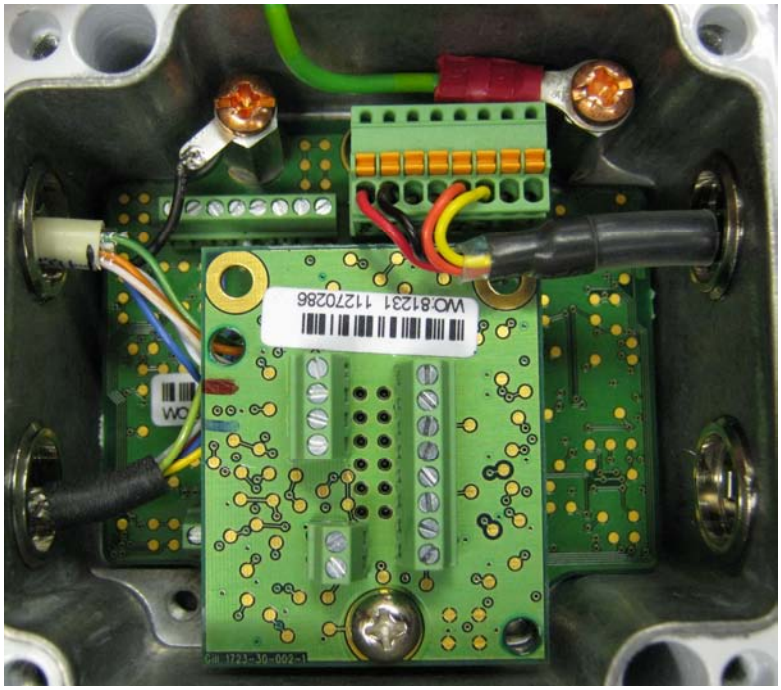
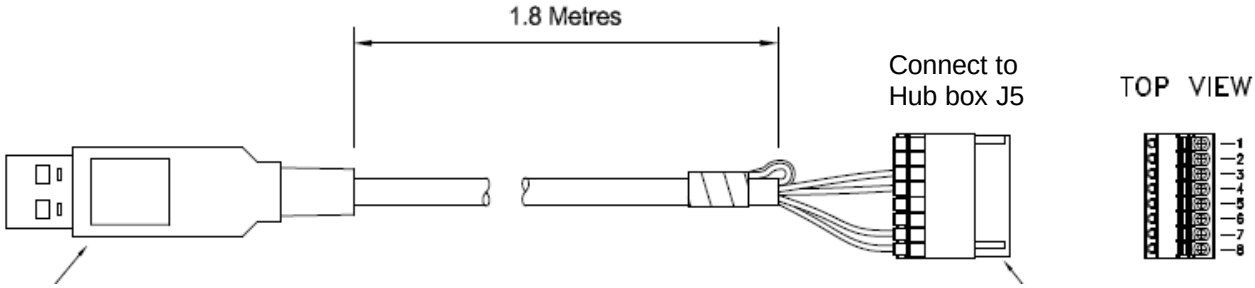


Figure 4 Hub Box with Digital Pec fitted.

USB Lead Connection (COMMS set for RS232)



Connect MetPak RG to a PC USB port using the Gill Configuration Cable 1723-10-051.

J5 Pin	1	2	3	4	5	6	7	8
Colour	None	None	Yellow	Orange	None	None	Black	Red

Figure 5 Connection of Gill USB Cable (Part No. 1723-10-051)

NOTE:- If upon connecting the USB lead to a PC the driver is not found by the PC, then the appropriate driver to match the PC Windows version may be downloaded from:-

http://www.ftdichip.com/Drivers/VCP.htm

Digital Output RS232 Connections (COMMS set for RS232)

This is the MetPak RG default communication configuration setting.

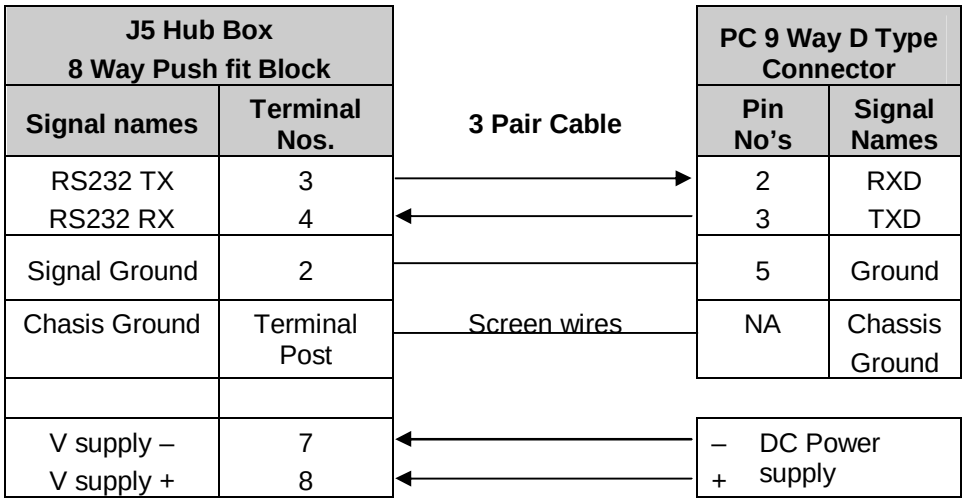


Figure 6 RS232 connections

Digital Output RS422 Connections (COMMS set for RS422)

This is not the default communications setting; ensure the MetPak RG has been configured for this output requirement before wiring to a user device.

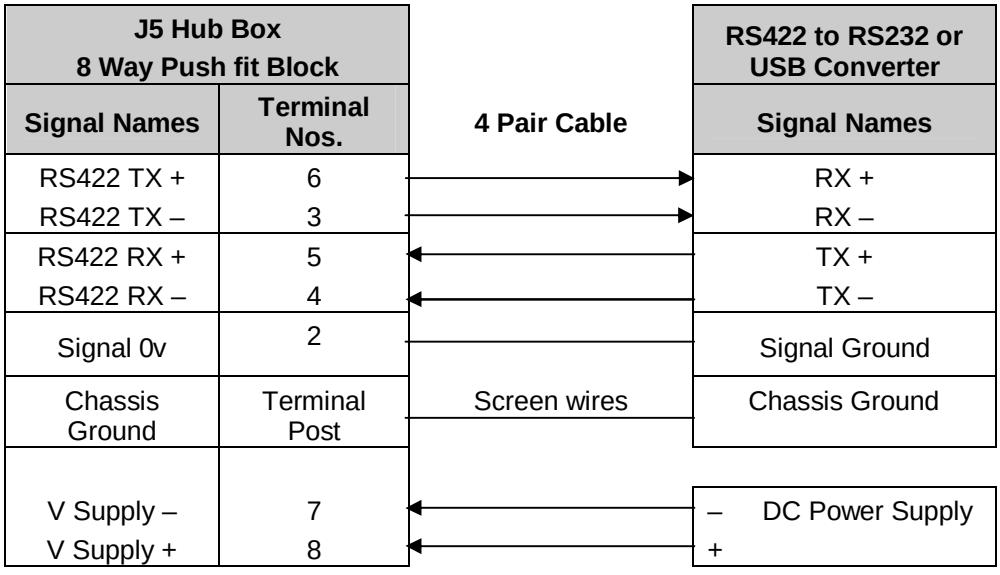


Figure 7 RS422 connections

Digital Output RS485S 2 Wire Point to Point Connections (COMMS set for RS485P2W)

This is not the default communications setting; ensure the MetPak RG has been configured for this output requirement before wiring to a user device.

Note that it is not possible to network other devices on this 2-wire RS485 link.

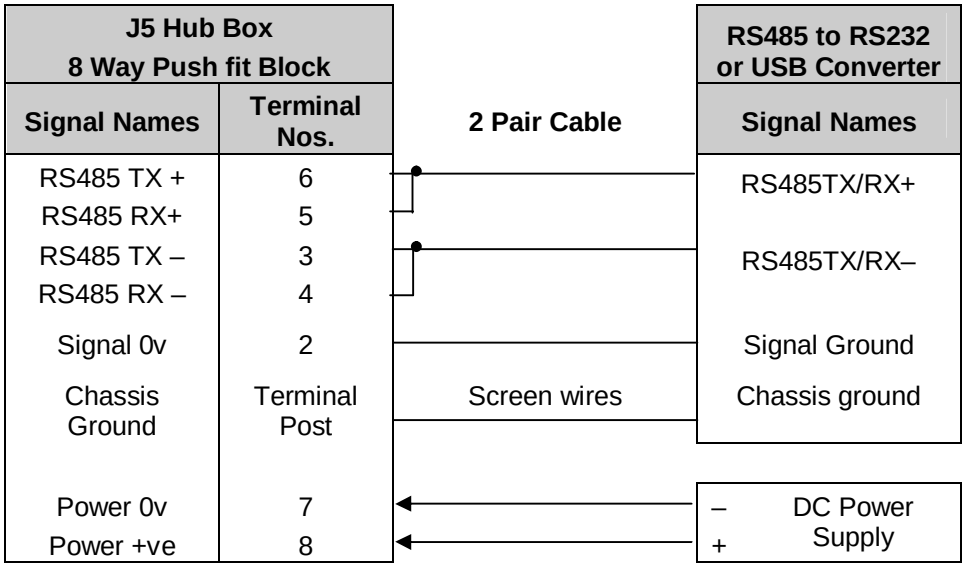


Figure 8 RS485 Connections

Digital Output SDI-12 Connections (COMMS set for SDI12)

This is not the default communications setting; ensure the MetPak RG has been configured for this output requirement before wiring to a user device.

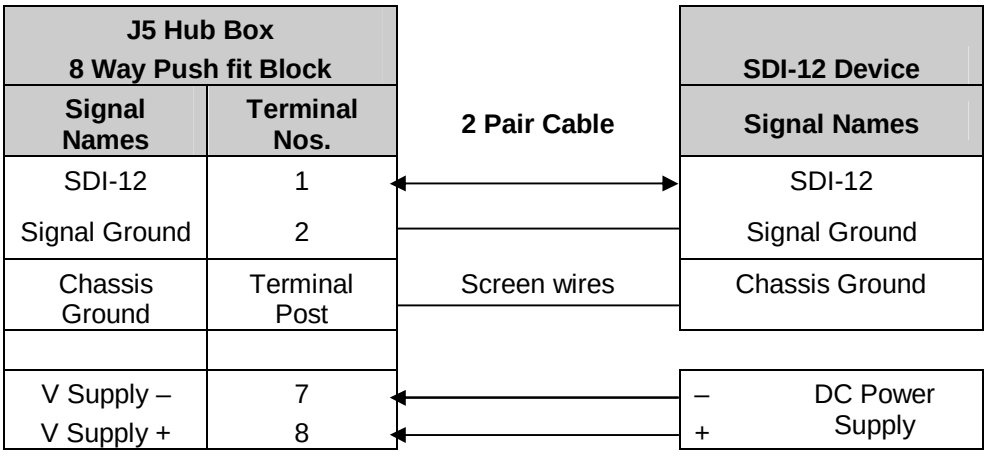
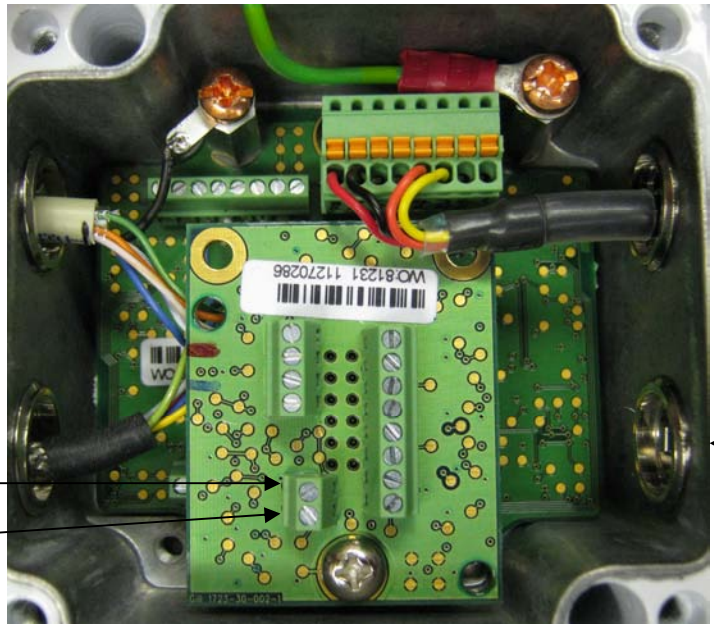


Figure 9 SDI-12 connections

2.2.5 Digital Rain Gauge Connections



Rain Gauge Digital Switch Connection (DIG 1)

J8 Hub Box 2 Way Terminal Block			Digital Switch e.g. Rain Bucket
Signal Names	**Terminal Nos.**	**Supplied 6M Cable**	**Signal Names**
DIG 1	2	Clear ←	Switch Contact
GND	1	Black →	Return Switch Contact
Chassis Ground	Terminal Post	Screen Wire	Chassis Ground

Figure 10 MetPak RG DIG 1 Rain Gauge Connections

To connect the Rain Gauge 6 Metre lead to the Hub Box.

1. Open MetPak RG's hub box by unfastening the four screws.
2. Locate connector J8 (see Figure 3).
3. Pass the cable through one of the gland nuts (see Note below).
4. Connect the cable as detailed in Figure 10.
5. Attach the cable's screen wire to a terminal post.
6. After connection, securely tighten the gland nut to prevent moisture ingress.

7. **NOTE**: The MetPak RG Hub Box cable glands contain spring loaded metal leaves that are designed to make a ground contact with cables that have an overall braid screen. Care is therefore required when inserting and removing cables through the glands to prevent damage to the metal leaves.

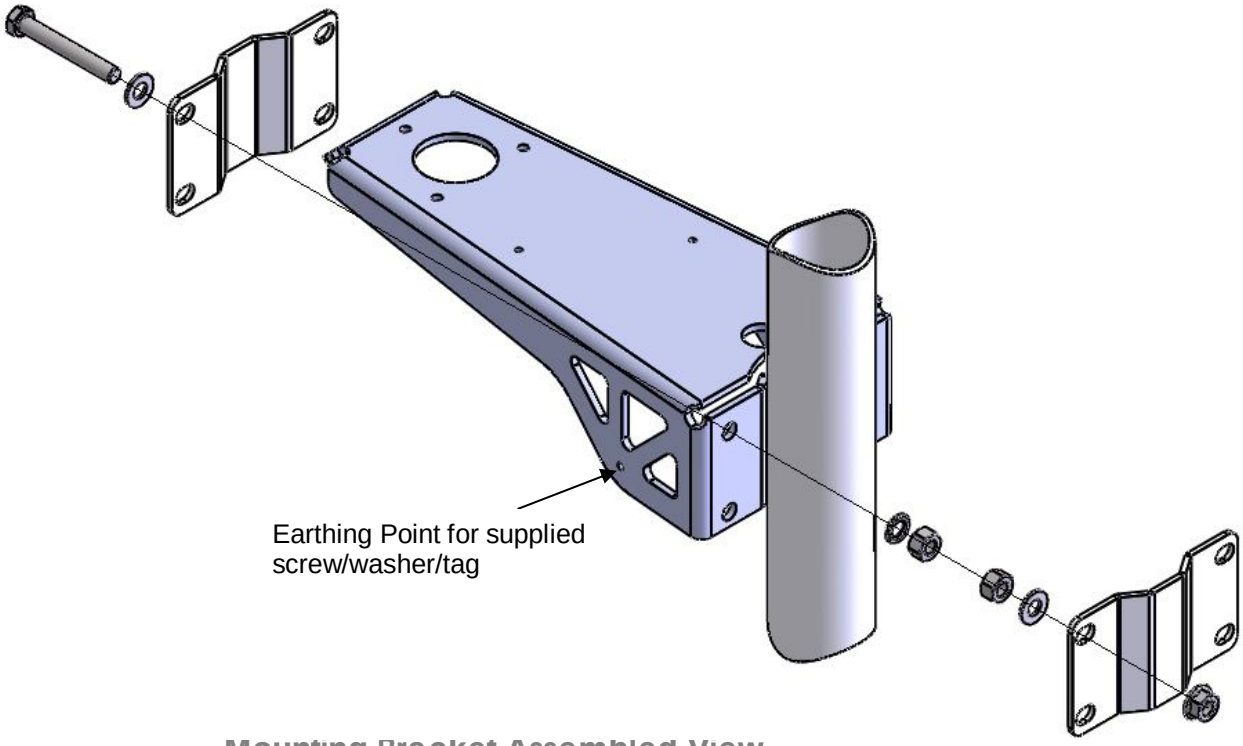
2.2.6 Mounting MetPak RG

MetPak RG uses a mounting clamp suitable for attaching to a vertical pipe with a diameter of 30-58mm (1.2 to 2.3 inches). When mounting MetPak RG, consider the position, orientation and alignment of the unit.

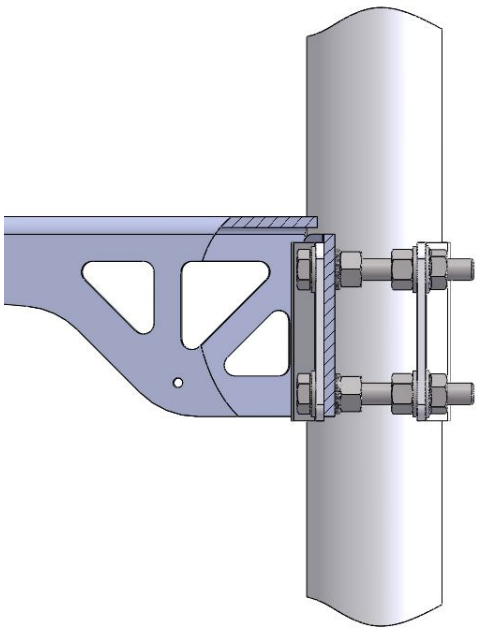
Note that the mounting pipe should first be degreased and when assembling the MetPak clamp assembly the outer clamp nuts need to be tightened evenly to a torque figure of 3 Nm.

The moving plate part of the clamp needs to be reversed for poles below 38 mm diameter.

Mounting Bracket Assembly Exploded View



Mounting Bracket Assembled View



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Position

It is the responsibility of the customer to ensure that the MetPak RG is mounted in a position clear of any structure, including the mounting post, which may obstruct the airflow or induce turbulence.

Orientation

Normally, the MetPak RG is mounted on a vertical pole, ensuring a horizontal Measuring Plane (see Figure 11).

For indoor use the unit may be mounted with the Measurement Plane set to any required orientation.

Alignment

The MetPak RG Wind Sensor should be aligned to point to North, or other required reference direction.

There are two arrows, a coloured rectangle, and an alignment notch on the WindSonic Wind Sensor that should point to North to aid alignment (See Figure 11).

Note. It is usually simpler to work first with a compass at ground level and identify a suitable landmark and its bearing.

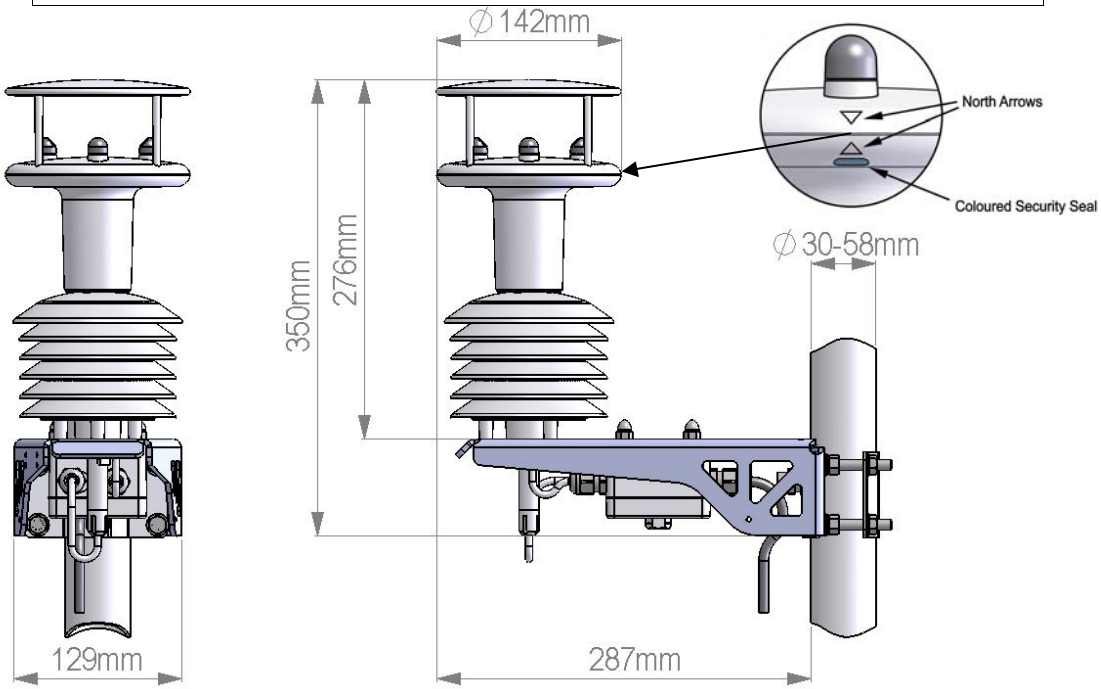

Figure 11 Correct Mounting Position for MetPak RG

Interference

Always check the installation to ensure the MetPak RG is not affected by other equipment operating locally, which may not conform to current standards, e.g. radio/radar transmitters, boat engines, generators etc.

See Para 2.1 for guideline details.

CAUTION. Do NOT mount the MetPak RG in close proximity to high-powered radar or radio transmitters. A site survey may be required if there is any doubt about the strength of external electrical noise.

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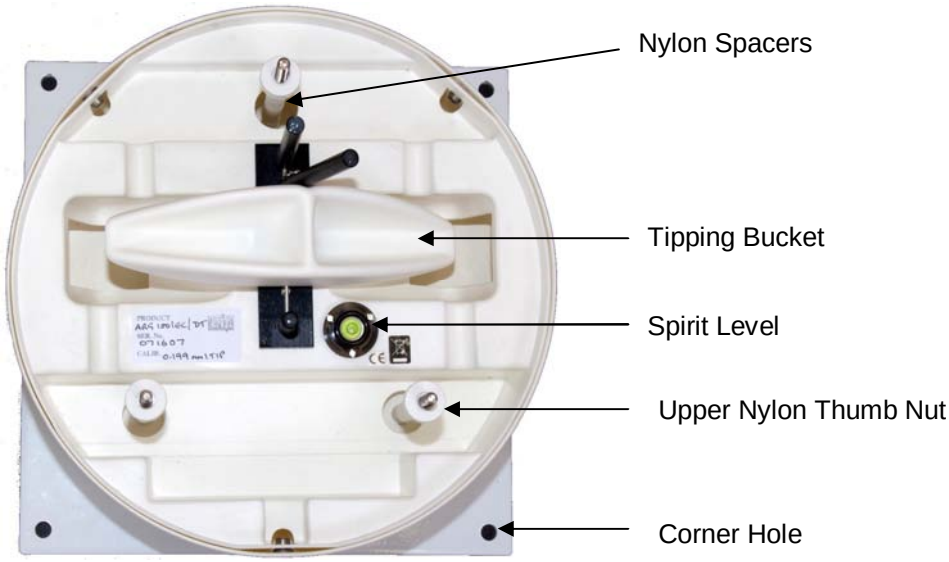
2.2.7 Mounting the Rain Gauge

The rain gauges tipping bucket mechanism is immobilised before shipping to prevent damage in transit. To release the mechanism, remove the funnel from its base by unscrewing the three nylon thumbscrews. Remove the piece of foam from under the bucket mechanism. This foam may be saved and used whenever the rain gauge is moved.

The MetPak RG mounting arrangement options: -

Baseplate Mounting

Due to the low weight of the rain gauge (1kg approximately) it must be mounted securely, the use of the Baseplate is recommended for this. However the gauge may be mounted via the three holes in the base to a paving slab for example. It is suggested that rawlbolts are used for this purpose as they provide a means of levelling the rain gauge.



Unscrew the 3 upper nylon thumb nuts and remove all the nylon spacers from the studs.

Lift off the tipping bucket base assembly to leave the metal baseplate and studs.

Fix the baseplate to level ground using the 4 pegs provided through the 4 corner holes. The baseplate may be mounted to hard surfaces like concrete by replacing the 4 supplied pegs with screws and rawlplugs.

For temporary mounting on hard surfaces use some bricks or heavy weights on the four corners of the baseplate (the height of the weights should be kept as low as possible to cause the minimum interference with the aerodynamics of the rain gauge).

Refit the tipping bucket base assembly.

Refit the nylon spacers over the 3 studs.

Loosely screw on the 3 nylon thumb nuts.

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Leveling the Base Assembly

Upon completion of the above adjust the 3 leveling thumb nuts under the tipping bucket to align the spirit level bubble to within the centre circle.

Now tighten the upper 3 thumb nuts ensuring that the spirit level bubble remains within the centre circle.

NOTES:

Ensure that the Foam insert under the tipping bucket is removed before re-fitting the funnel.

No two rain gauge designs are ever likely to produce identical results, and identical rain gauge can give slightly different catches even when sited close to each other.

Customers with 2 or more sets of equipment must not swap around rain gauges with MetPaks without using MetSet to change the calibration figure.

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3. Operation

This section provides an overview of the operation of the MetPak RG. For more detailed information about any of the steps, use the references to other sections of this manual.

3.1 Start Guide

Decide how you are going to connect MetPak RG to your PC or communications network. MetPak RG supports the following options:

- USB connection using Gill's RS232 to USB 1.8M configuration cable (includes integral 5V power supply) compatible with MetSet. To order, contact your dealer quoting part number: 1723-10-051).

  NOTE. You could use an equivalent RS232-USB adapter such as EasySynch RS232 to USB adaptor.

- RS232 connection using standard cable and PC COM port. Separate 5V to 30V dc power supply also required (compatible with MetSet).
- RS422 using RS232 converter (compatible with MetSet).
- RS485 2 wire point to point (not compatible with MetSet).
- SDI-12 connection (note SDI-12 is not compatible with MetSet Software).

  NOTE. MetPak RG is pre-configured for RS232 communication (factory setting). If you want to use an alternative communication protocol, you will need to set up the unit using an RS232 connection (with an appropriately wired cable), change the setting, shut the unit down, attach a cable for the new communication type, and then restart the unit.

Unpack MetPak RG. Check that you have the following:

- MetPak RG unit (Part No.1723-3B-2-111).
- Rain Gauge and four pegs.
- Gill MetView and MetSet Software and Manual supplied on the CD.

If any parts are missing, please contact your dealer.

1. Open the connection box by unfastening the four retaining screws. Locate the connector: J5 (see Page 9, Figure 3). Carefully pull the connector block from its pins.
2. Prepare the communications cable by stripping the wires to a length of 8mm. Feed the prepared cable through one of the two available ports on the side of the connection box (please refer to the 2nd NOTE on Page 8).
3. Connect the cable to J5 as required for your chosen communications method.
4. Carefully press J5 onto its circuit board pins.
5. If connecting the 6 Metre Rain Gauge cable to the Digital Input, strip cable wires, (if necessary) and connect to connector J8 in the hub box.

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6. Tighten the gland on the connection ports to seal the cables in place. Replace the top on the connection box.
7. If you are carrying out a bench test, continue to step 13. When you have finished testing, return to Step 10.
8. Ensure that if using a mounting pole that it has been degreased in the area where the MetPak RG will be positioned.
9. Position the MetPak RG against the mounting post (see page 15), fit the mounting kit bracket and tighten sufficiently to hold the unit in place but allowing it to be rotated or moved up and down the pole.
10. Check the orientation and alignment of the unit (see page 14).
11. Check the height of the unit and ensure it is clear of any obstructions, including the mounting post, that could interfere with MetPak RG's measurements (see page 15).
12. Tighten the mounting bracket nuts evenly to a toque figure of 3Nm to hold the unit firmly in place.
13. Connect the communications cable to your PC or network device.
14. Place the MetPak RG CD in your PC's CD drive and install MetSet and MetView.

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3.2 MetView

Before you can use MetView, check that MetPak RG is correctly connected to a Serial COM port or USB COM port on your PC.

NOTES: MetView is compatible with RS232 and RS422 connected units only.

MetView will note read NMEA data strings.

3.2.1 Opening MetView

Click on the MetView button on your PC's desktop or choose:

Start > Programs > MetView > MetView

The MetView Control Centre window is displayed.

Scan Button– If MetPak RG transmit and receive wires are connected to the PC then use the Scan button to connect to MetView.

Connection is Receive Only Tick Box – Use if the MetPak RG connection to the PC has only transmit wires connected and a MetSet version of its current device settings is available to upload to MetView. Select 'Connection is Receive only' tick box and click on the Scan button. Upload a MetSet generated Device file from a PC location as directed.

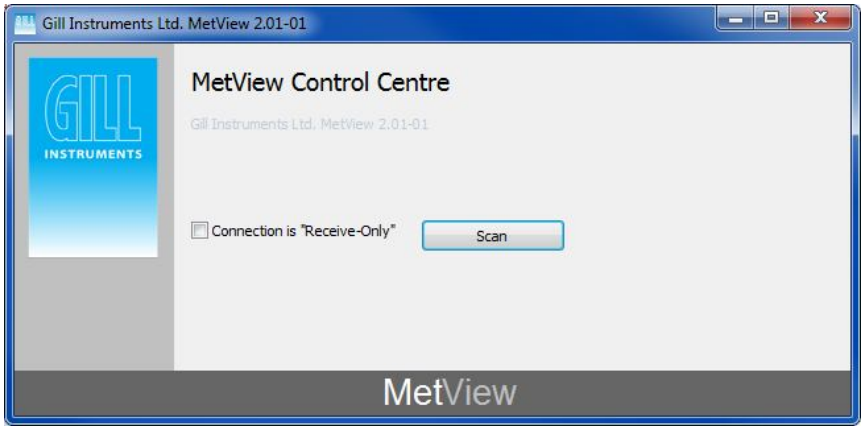

Figure 12 Opening MetView Screen

3.2.2 Scanning for Devices

To set up communicate between MetView and a connected MetPak RG.

Click on the **Scan** button to search the available COM ports for MetPak RG devices.

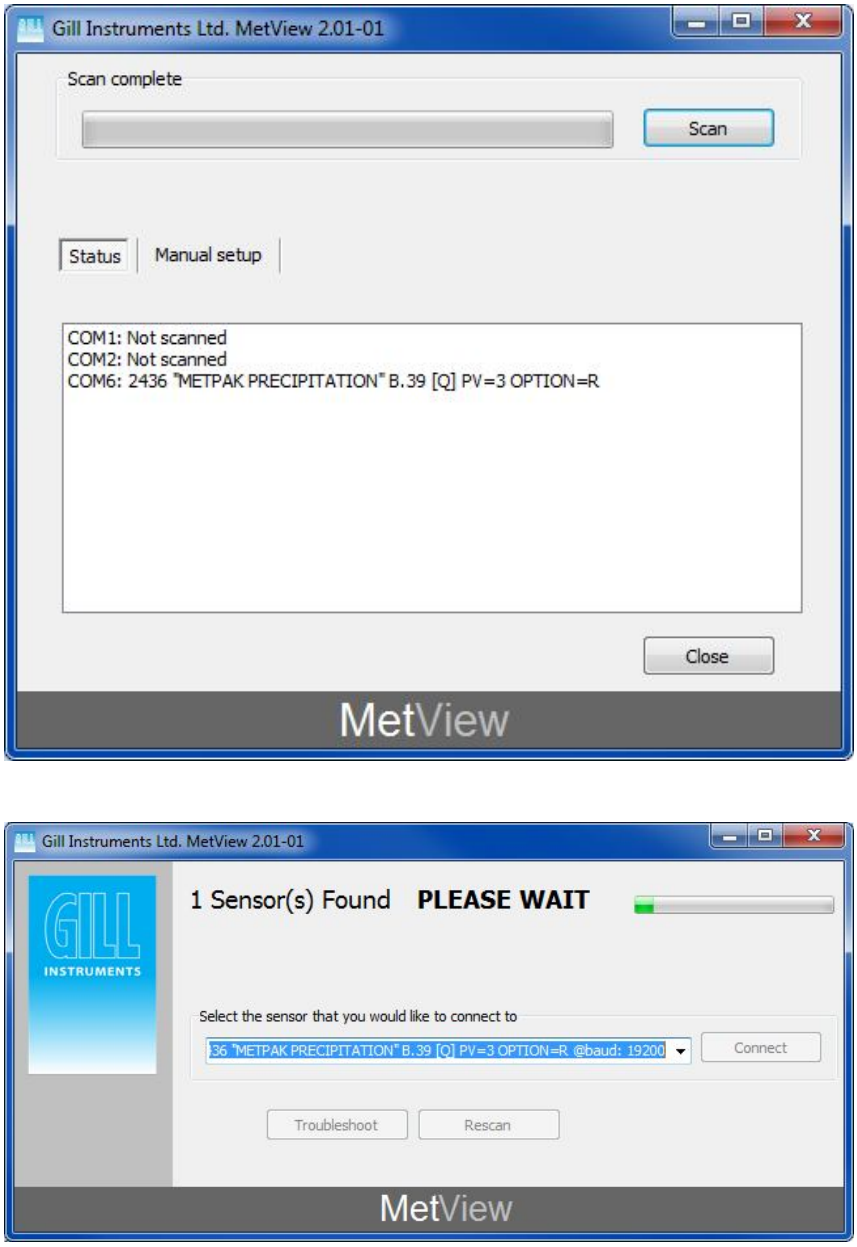

Figure 13 Scanning for MetPak RG Devices

When a device is found, MetView obtains the MetPak RG configuration settings and then retrieves and displays MetPak RG data.

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3.2.3 The MetView Console

When connected correctly, MetView displays its data-monitoring console. This consists of gauges showing: Wind Direction, Wind Speed, Pressure, Humidity, Temperature and Total Rainfall. There is also a digital readout of Dew Point. Buttons beneath each of the gauges allow you to choose the displayed units and other options. Each gauge (except Rainfall) also shows the maximum and minimum values recorded during the current session. The wind speed gauge also shows the maximum gust speed.

Note: MetView will not show data if the unit is set for NMEA or SDI-12 format.

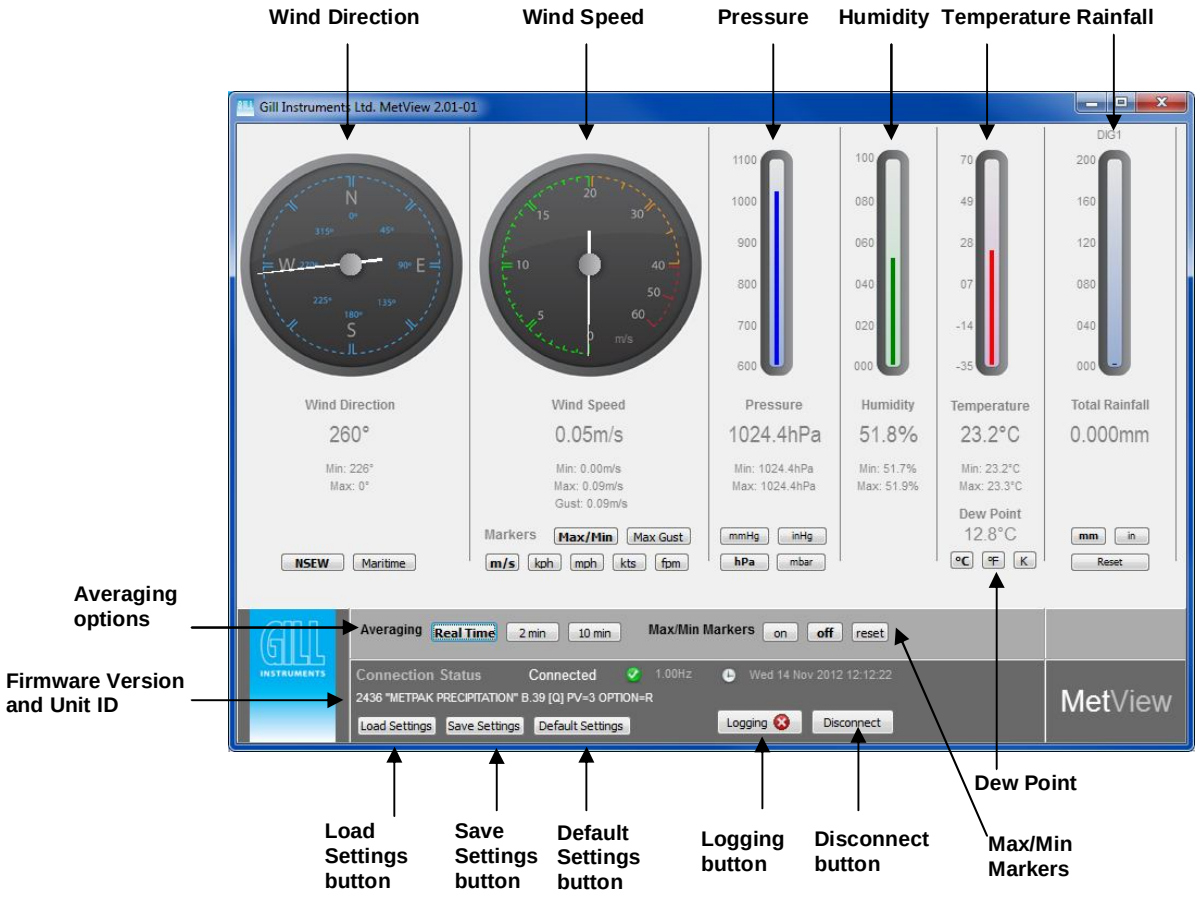

Figure 14 The MetView Console

Connection Status

Table 4 Connection status indicators

Reading	Function
Green Background Tick	Indicates MetPak RG logging or communicating correctly with MetView along with reading the MetPak RG firmware version.
Red Background Cross	Indicates MetPak RG not logging.
1.00Hz	Indicates the output rate of the MetPak RG when connected. Reads when the unit is communicating correctly with MetView.
Wed 14 Nov 2012 12:12:22	Real Time PC date and time indication.

MetPak RG Rainfall Gauge Display

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DIG 1 Input with user definable title

On switch on MetView commences an incremental count of the total rainfall to date.

The reset button will zero the MetView reading and recommence a new total count.

Note. The order in which the instruments are shown in the MetView display reflects the order in which the instrument data appears in the MetPak RG data string.

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3.2.4 MetView Console Display Options

MetView Console buttons can convert data from the MetPak RG to read different units or scale settings. This does not alter the actual MetPak RG configuration.

Units shown in **bold** denote default settings

Table 5 MetView scale and unit options

Gauge	Function
Wind Direction	Use buttons to choose from two display styles: **NSEW** or Maritime
Wind Speed Markers	Use buttons to add markers on the gauge for **Max/Min** or Max Gust.
Wind Speed	Use buttons to choose from five wind speed units: **m/s**, kph, mph, kts, fpm
Pressure	Use buttons to choose from pressure scales: **hPa**, mbar, inHg, mmHg
Humidity	Displays Max and Min values during current session in **%**
Temperature & Dew Point	Use buttons to choose from three temperature scales: **°C**, °F, K
DIG1	Typically for Rain, buttons available for inches or millimetres and a reset button.

Table 6 MetView averaging options

Setting	Function
Real Time	Choose this button for no averaging
2 Min	Select for 2 minute rolling average of all sensor readings except DIG1
10Min	Select for 10 minute rolling average of all sensor readings except DIG1

Table 7 Max/min markers

Setting	Function
Off	Maximum and Minimum Markers on all gauges turned off
On	Maximum and Minimum Markers on all gauges turned on
Reset	Reset all Gauge Maximum/Minimum Markers and all digital Maximum/Minimum reading at will

Table 8 MetView Screen Settings Options

Setting	Function
Save Settings	Will Save all the current MetView screen settings to a file for later retrieval if required.
Load Settings	Will load and update the MetView screen with a previously saved setting.
Default Settings	Will return all MetView screen settings to factory default.

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3.2.5 MetView Gauge Ranges and Graphs

Gauge Range Settings.

MetView Pressure, Humidity, Temperature and Rainfall Gauge ranges may be altered to view changes in conditions more visibly.

Note, these changes only affect MetView settings and do not affect the MetPak RG output.

For instance if the typical temperature measurement range required is from +10 degrees to +40 deg C then the temperature gauge range can be adjusted to reflect this.

Place the mouse pointer over the Temperature display gauge and double click to bring up the Set Gauge Range screen. Change Max and Min readings to required values, e.g. +10 min and +40 max.

Click on Set.

The Temperature gauge range will be updated to reflect the change.

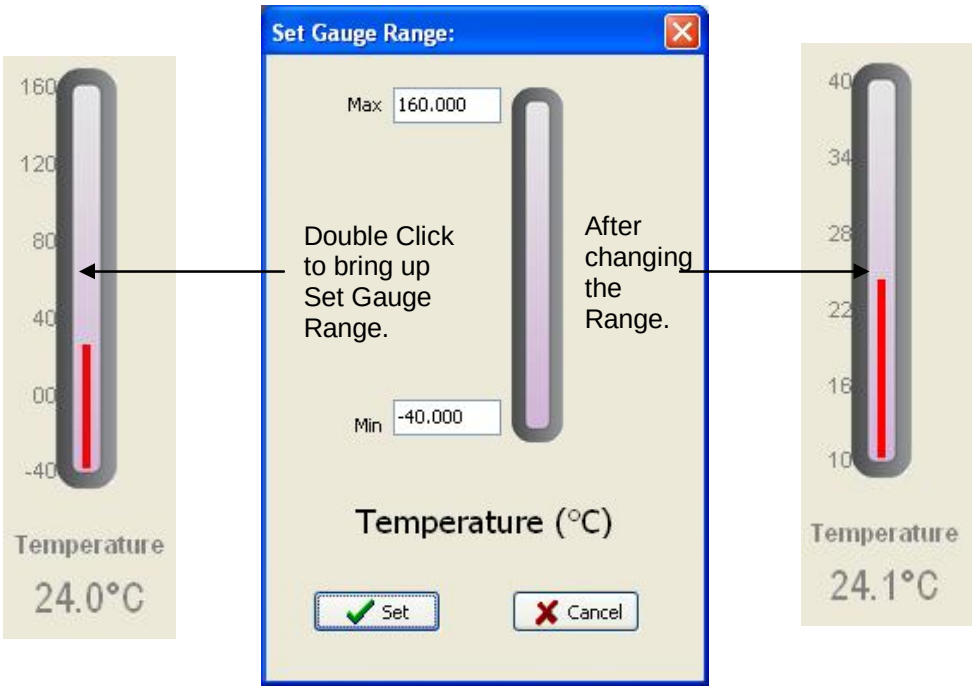


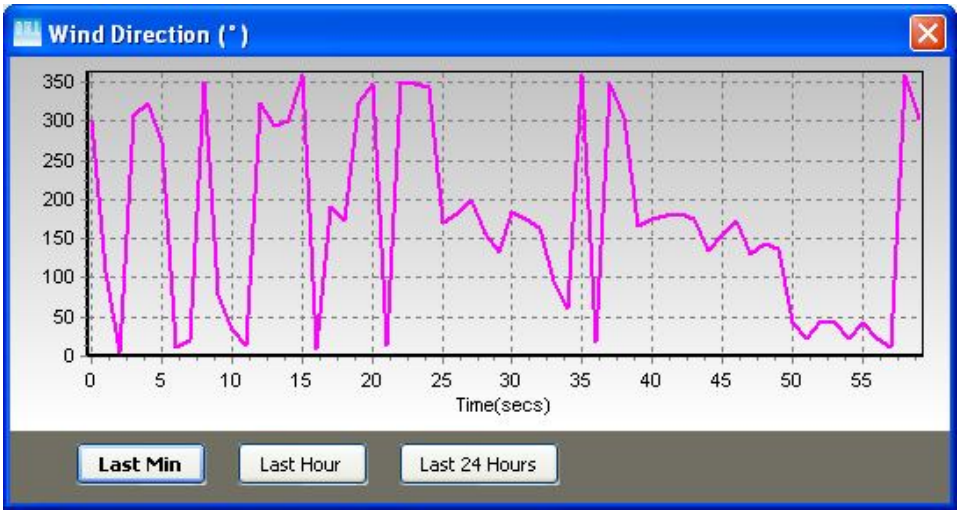
Figure 15 MetView Gauge Range

Graphs

MetView allows data detected over the last minute, last 1 hour and last 24 hours to be accessed and shown on a graph.

Note. Data is only shown up to the time when the graph function is selected; the graph is not updated once opened. Data is collected from the time that MetView is opened and reading data from a MetPak RG.

Double Click on the reading to bring up the graph.



Click on the Last Min, Last Hour or Last 24 Hours buttons as required to view data.

Figure 16 MetView Graph

3.2.6 Data logging

NOTE. MetView logs data based on the MetPak RG configuration not on the MetView console settings.

To log MetPak RG data, click on the **Logging** button on the MetView console. The *Logging* dialog box is displayed.

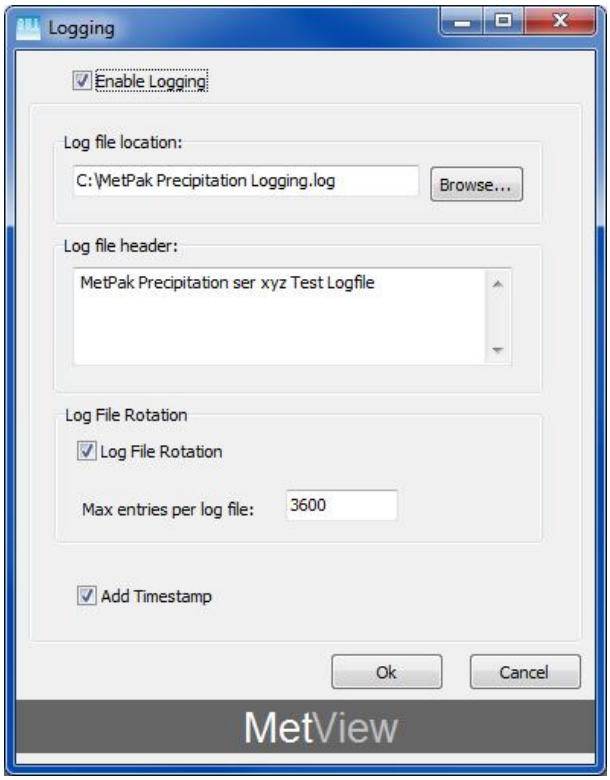


Figure 17 Setting up data logging

Setting up a logging file

Select **Enable Logging** to start logging to a file.

Identify the name and location for the logging file:

Log File location Click on the **Browse** button to identify the folder where you want to store the data file. Enter the name of the file.

Log file header If required type some notes on the data that is to be recorded which will appear at the top of the saved data log file.

Choose from the following additional options:

Log File Rotation Set up segmented logging with each logged file length determined by the number entered in the text box below. The figure 3600, for example, means that each log file length will be 3600 lines of data. Maximum entries per log file are limited to 65535 and a maximum of 2048 log files can be created.

Add Timestamp Adds the date and time to the logged data file taken from the PC clock.

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To start logging

Check that the **Enable Logging** option is selected.

Click on the **OK** button to commence logging and return to the console.

Note. To show that data is being recorded, the Logging button's icon changes to a green tick:

Logging active

Logging stopped

To stop logging

Click on the **Logging** button on the MetView console. Clear the **Enable Logging** check box.

Click on the **OK** button. If logging has stopped, the Logging button shows a red background cross instead of the green background tick (see above).

Understanding Logged Data

Logged data is stored to a file with a **.log** extension. This can be viewed in any text/HTML editor or spreadsheet application.

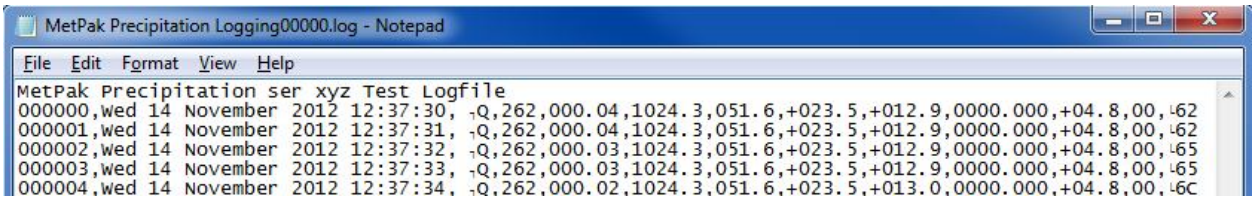
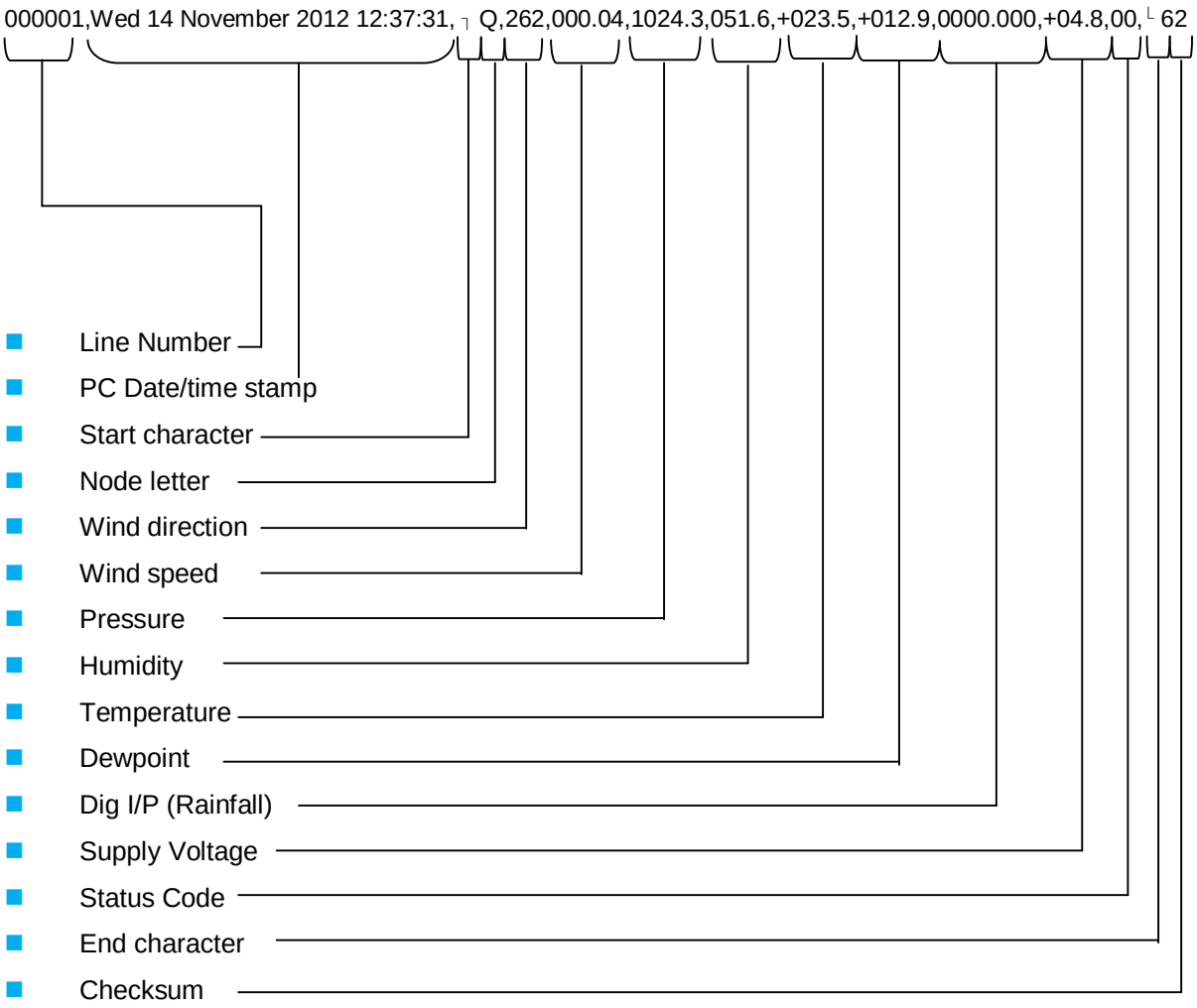


Figure 19 A typical data log (viewed in Windows Notepad)

Each entry in the default reporting order consists of the following:



3.3 MetPak RG Configuration

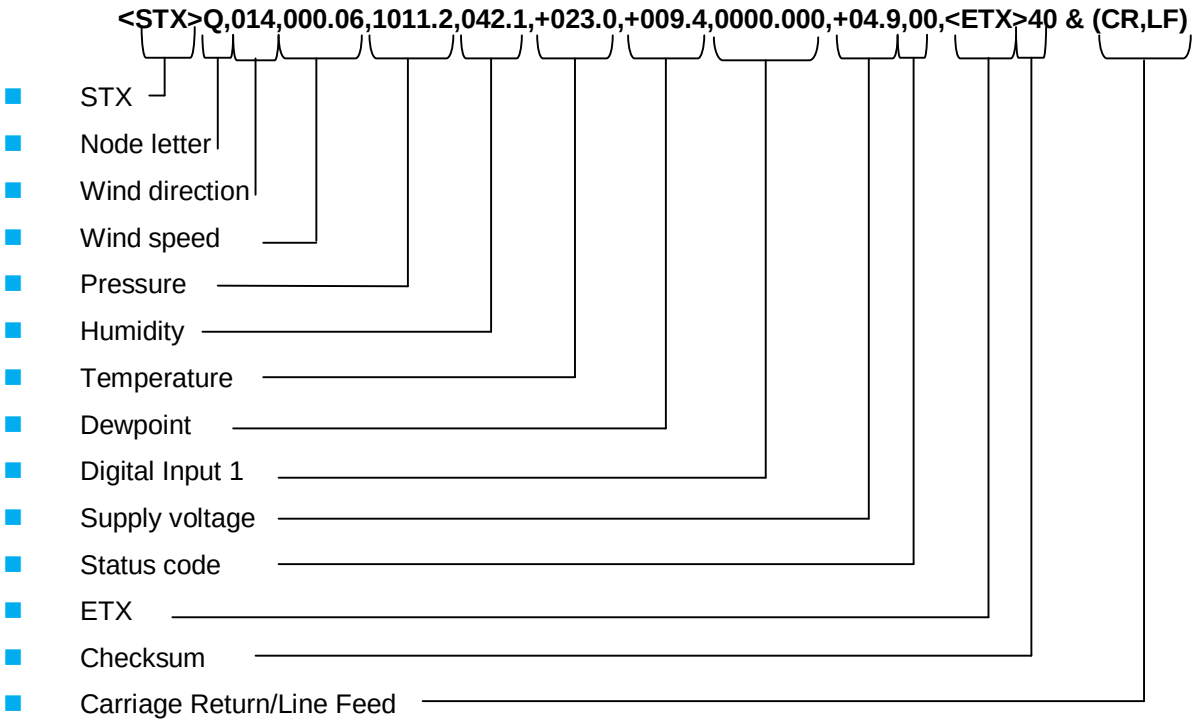
MetPak RG can be configured using Gill MetSet software.

The default configuration settings are listed in the following table.

Table 9 Default configuration settings

Setting	Function
Comms Levels	RS232
Baud Rate	19200
Data Connection	Data Bits 8, Parity None, Stop Bits 1, Flow Control None.
Node ID	Q
Output rate	1Hz
Message Mode	Continuous
ASCII Set Up	Carriage return and line feed, Echo on
North Alignment	0
Sensor WindSpeed	On
Wind Speed Units	MS (Metres/Second)
Temperature Sensor	On
Temperature Units	C (Degrees Celsius)
Dewpoint Sensor	On
Dewpoint Units	C (Degrees Celsius)
Pressure Sensor	On
Pressure Units	Hecto Pascals
Humidity Sensor	On
Humidity Units	%
Report Format	Node, Polar (Wind Direction and Wind Speed), Pressure, Humidity, Temperature, Dewpoint, DIG1, Volts, Status, Checksum.
Status Message Output	On
Report Message Output	On
Units Message Output	On
Inputs Message Output	On
DIG1 Sensor Type	On
DIG1 Units	mm
DIG1 Digital Count	10.000
DIG1 Substitute Name	-
Output Sentence	Comma Separated Variable

Example MetPak RG Default Data String:



NOTES:

<STX> is the Start of String character (ASCII value 2).

<ETX> is the End of String character (ASCII value 3).

Checksum, the 2 digit Hex Checksum sum figure is calculated from the Exclusive OR of the bytes between (and not including) the STX and ETX characters.

NOTE. Switch on Time.

Upon switching on the MetPak Pro, allow 9.5 seconds to elapse before data is output.

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Configuring the Digital Switch Input (Rain Gauge Input)

See Para 6.1 for Technical Specification.

Configuring using MetSet.

MetSet DIG1 Edit screen can be used to allow a MetPak RG count value to be input.

The DIG1 Count value can be set from 0.001 to 10.000 in steps of 0.001 to represent one switch closure event taking place.

In Continuous Output Mode

A count will occur of the number of switch closure events taking place over 1 second (default 1Hz output rate or during 2 seconds (0.5Hz) or during 4 seconds (0.25Hz)) and will be output in each digital data output reading (when DIG 1 enabled).

In Polled Mode

The MetPak RG will store and output the cumulative total number of switch closures since the last poll request. Once the cumulative total has been output the count will be reset to zero.

The maximum number of count events will be 9999, if the number counted exceeds 9999 an overflow character E will be output in the data string.

3.4 Configuring MetPak RG with MetSet

Before you use MetSet check that MetPak RG is correctly connected to a Serial COM port or USB COM port on your PC.

3.4.1 Opening MetSet

Click on the MetSet button on your PC's desktop or choose:

Start > All Programs > MetSet > MetSet

The MetSet Control Centre window is displayed. If you have more than one MetPak RG connected to your PC, MetSet, by default, selects the first device detected.

For most applications it is recommended to click on the MetSet **Connect and Read** button.

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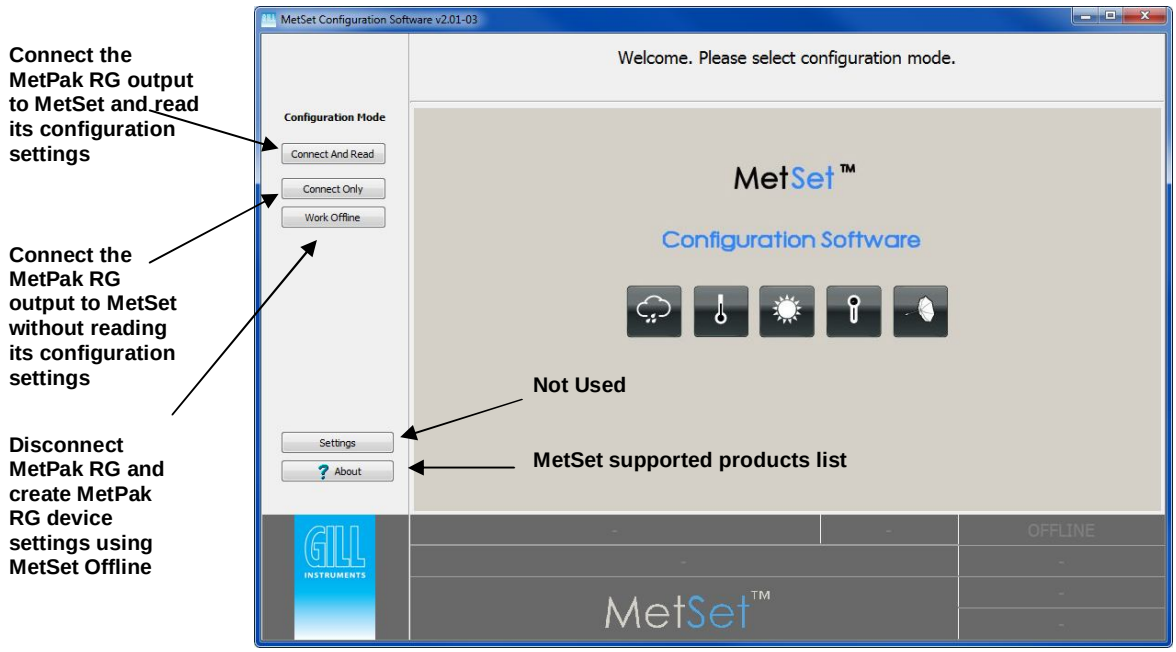


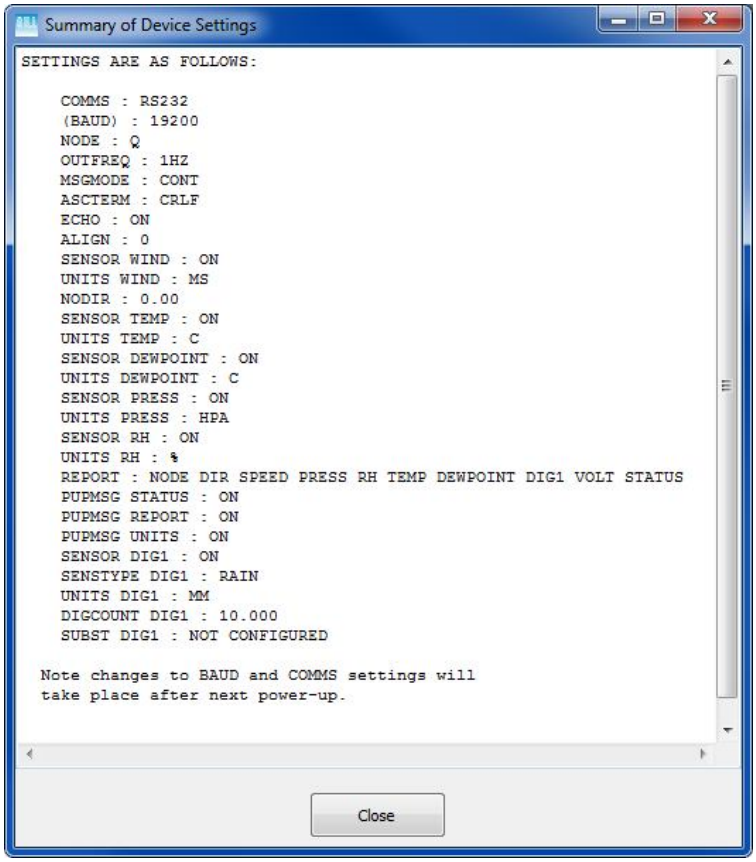
Figure 18 Opening MetSet Screen

MetSet interrogates the MetPak RG and returns a summary of the device settings.

Note that MetSet also saves a copy of this screen to the connected PC as a Session Report File that can be accessed from the following destination.

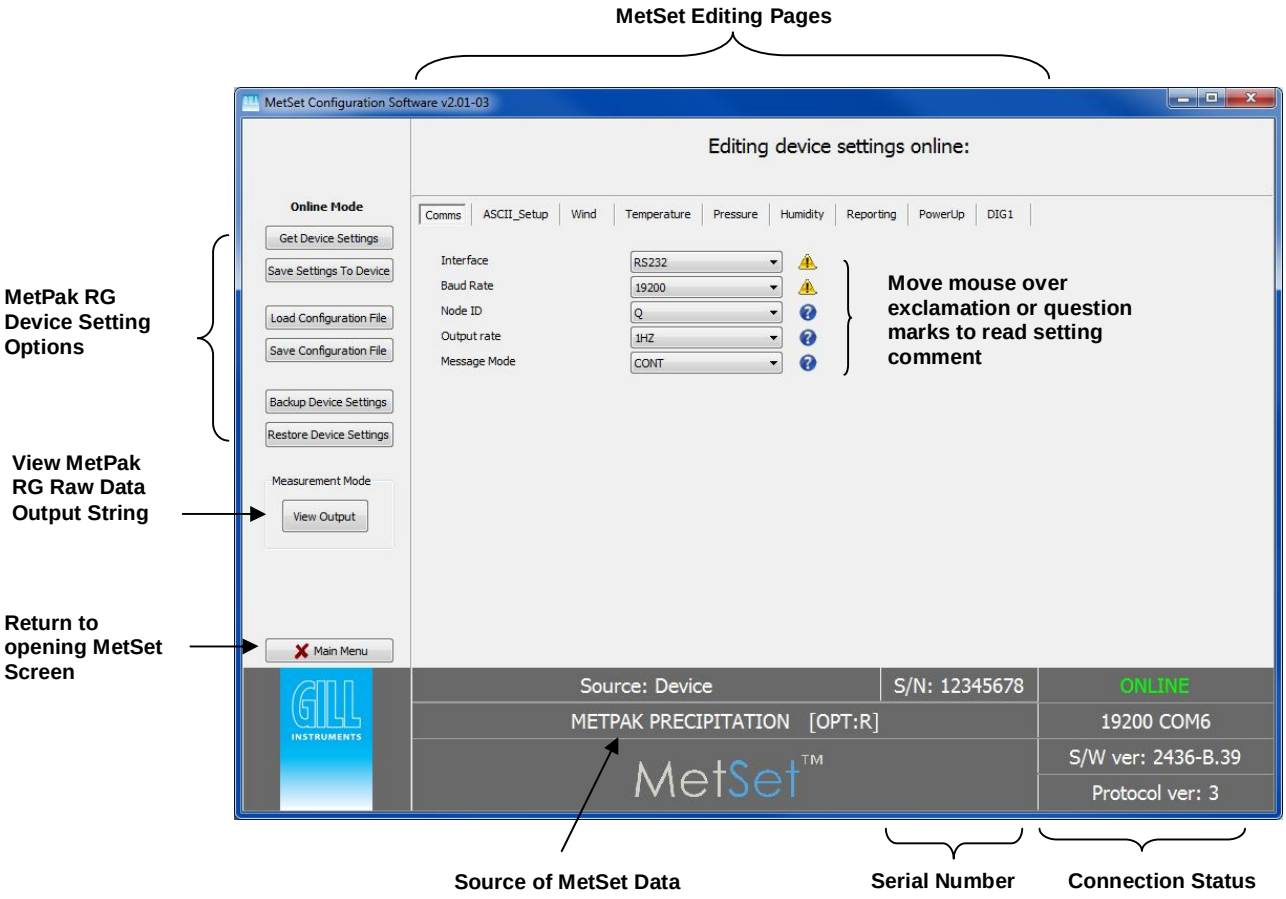
C:\Program Files(X86)\Gill Instruments\MetSet\SessionReports

Close this screen to go to the Editing screens.


Summary of Device Settings
SETTINGS ARE AS FOLLOWS:
COMMS : RS232
(BAUD) : 19200
NODE : Q
OUTFREQ : 1HZ
MSGMODE : CONT
ASCTERM : CRLF
ECHO : ON
ALIGN : 0
SENSOR WIND : ON
UNITS WIND : MS
NODIR : 0.00
SENSOR TEMP : ON
UNITS TEMP : C
SENSOR DEWPOINT : ON
UNITS DEWPOINT : C
SENSOR PRESS : ON
UNITS PRESS : HPA
SENSOR RH : ON
UNITS RH : %
REPORT : NODE DIR SPEED PRESS RH TEMP DEWPOINT DIG1 VOLT STATUS
PUPMSG STATUS : ON
PUPMSG REPORT : ON
PUPMSG UNITS : ON
SENSOR DIG1 : ON
SENSTYPE DIG1 : RAIN
UNITS DIG1 : MM
DIGCOUNT DIG1 : 10.000
SUBST DIG1 : NOT CONFIGURED
Note changes to BAUD and COMMS settings will
take place after next power-up.
Close

3.4.2 MetSet Editing Screen

When connected correctly a MetSet editing screen is available to read configuration settings, change configuration settings, save MetPak RG configuration settings to a PC file location, upload MetPak RG configuration settings from a PC file and view the MetPak RG raw data string output,



MetSet Connection Status Information.

Reading	Function
S/N: 12345678	MetPak RG Number
ONLINE	ONLINE in green indicates the MetPak RG has been successfully connected to MetSet. OFFLINE in Grey indicates that MetSet is being used without a MetPak RG in communication with MetSet.
19200 COM 6	19200 reports on the MetPak RG Baud rate setting. COM 6 reports on the MetPak RG COM Port connection number.
S/W ver:2436-B.39	2436 is the MetPak RG Firmware number B.39 is the firmware revision. Protocol Version:3 .
Source: Device	MetSet reads 'Device' when the source of the data that MetSet has retrieved has come from the MetPak RG. MetSet reads 'File' when the source of data has come from a saved file. MetSet reports on the connected MetPak device (METPAK RG) and reads the unit Serial Number (S/N: 12345678).

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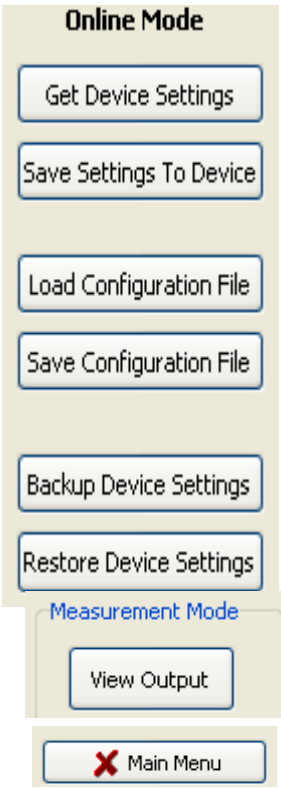
MetSet Online Settings.

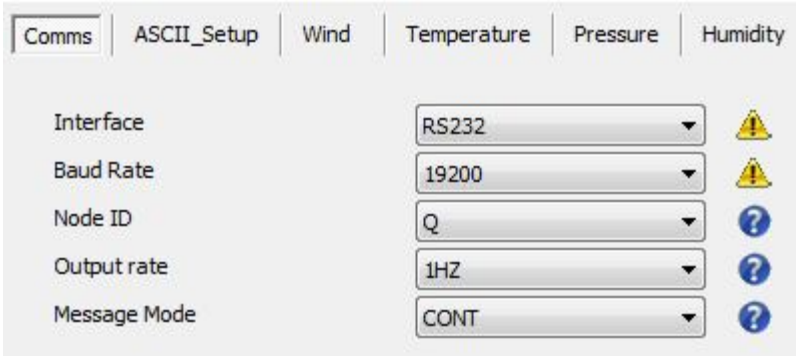


Online Mode Buttons	Function
Get Device Settings	MetSet retrieves the MetPak RG Configuration settings.
Save Settings to Device	MetSet configuration settings are saved to a connected MetPak RG.
Load Configuration File	When selected MetSet retrieves a MetSet edit PC file and updates MetSet with these settings.
Save Configuration File	When selected MetSet edit settings are saved to a PC file location.
Back Up Device Settings	When selected the MetPak RG configuration settings are transferred to MetSet and then to a file location selected on a PC.
Restore Device Settings	When selected MetSet retrieves a MetPak RG configuration setting from a PC file, loads it into the MetPak RG and updates the MetSet edit settings.
Measurement Mode View Output	Click on View Output to view the raw ASCII MetPak RG data string scrolling at the output rate. (View only feature). E.g. ┐Q,262,000.04,1024.3,051.6,+023.5,+012.9,0000.000,+04.8,00,└ 62
Main Menu	Click here to go back to the opening MetSet screen

MetSet Editing Page Functions.

Click on any page to select set up parameters.

The Comms Page can be used to Select:-



Interface:- **RS232**, RS422, RS485 (point to point) and SDI-12.

Baud Rate:- 4800, 9600, **19200**, 38400 or 57600

(1200 auto selected with SDI-12 setting).

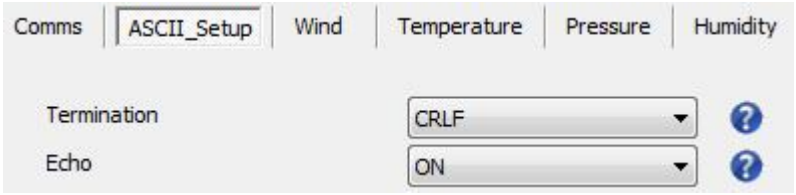
Node ID:- A to P, **Q** to Z.

Output Rate:- 0.25Hz to **1Hz**.

Message Mode:-**Continuous** or Polled.

NOTE: When COMMS or Baud Rate settings are changed and Saved to Device a warning is issued by MetSet. These setting changes will not become active until the MetPak RG power is turned off and turned on again. The connecting device will then also need its Comms and Baud rate settings changed to match the MetPak RG.

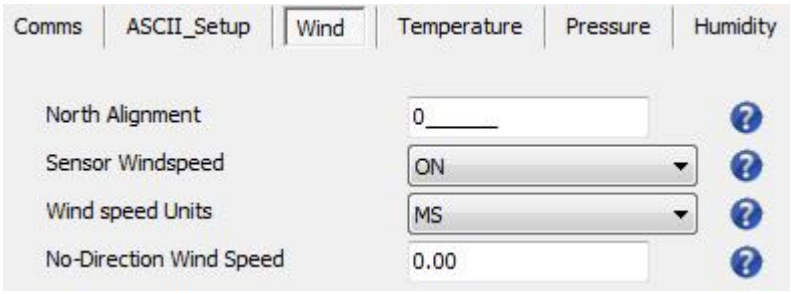
The ASCII Set Up Page can be used to select:-



Termination:- **CRLF** or CR

Echo:- **ON** or OFF.

The Wind Page can be used to select:-



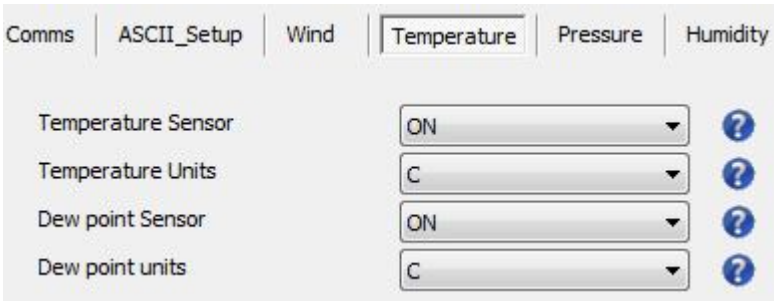
North Alignment from **0**-359 degrees.

Sensor WindSpeed **ON** or OFF.

Wind Speed Units **MS,** KTS, MPH, KPH, FPM.

(Metres/Second, Knots (Nautical miles/hour), Miles/Hour, Kilometres/Hour, Feet/Minute).

The Temperature Page can be used to select:-



Temperature Sensor **ON** or OFF

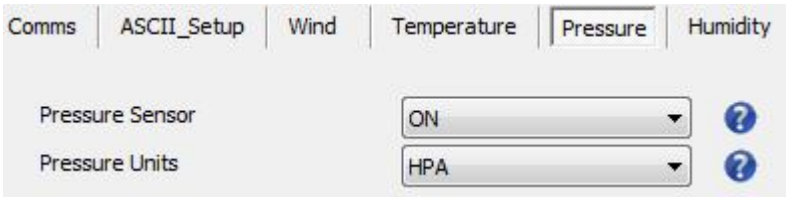
Temperature Units **C,** K or F

Dew Point Sensor **ON** or OFF

Dew Point Units **C**, K or F

(Centigrade, Kelvin, Fahrenheight)

The Pressure Page can be used to select:-

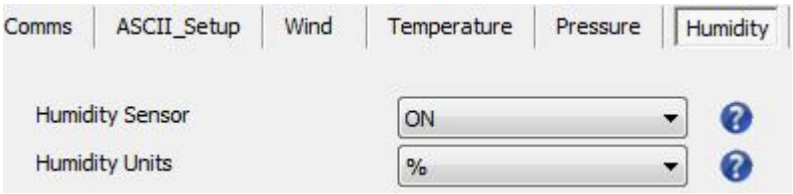


Pressure Sensor **ON** or OFF

Pressure Units **HPA**, MB, MMHG, INHG

(HectoPascals,Milli-Bars, Millimetres Mercury, Inches Mercury).

The Humidity Page can be used to select:-



Humidity Sensor **ON** or OFF

Humidity Units **%**

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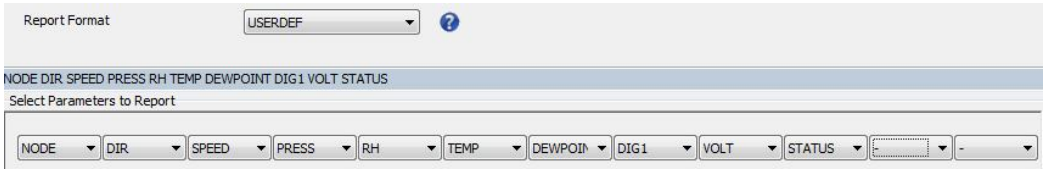
The Reporting Page can be used to select:-



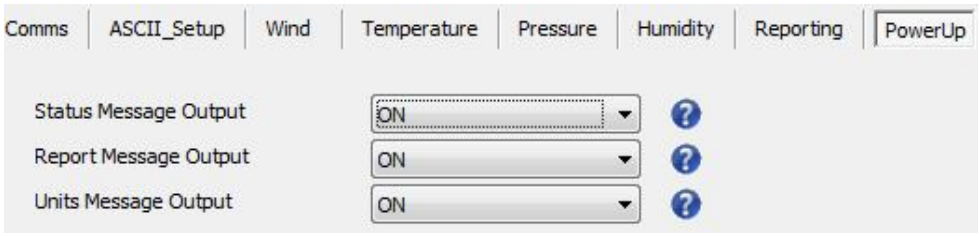
Report Format **FULL** or USERDEF

Select Parameters to Report

NODE,DIR,SPEED,PRESS,RH,TEMP,DEWPOINT,DIG1,VOLT,STATUS.

Report parameters can be selected in any order or on or off in USERDEF.

The Power Up Page can be used to select:-



Status Message Output **ON** or OFF.

(E.g. METPAK RG OPTION R 2436 VB.39, STARTUP: OK)

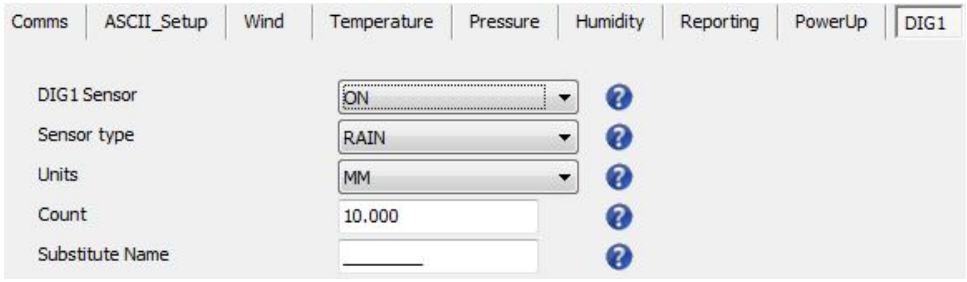
Report Message Output **ON** or OFF.

(e.g. NODE,DIR,SPEED,PRESS,RH,TEMP,DEWPOINT,DIG1,VOLT,STATUS,CHECK)

Units Message Output **ON** or OFF

(e.g. -,DEG,MS,HPA,%,C,C,MM,V,-,- DIG1 = CONFIGURED)

The DIG1 Page can be used to select:-



DIG1 Sensor **ON** or OFF

Sensor Type Should be left selected to **RAIN**

Units **MM** or IN

Count can be set from 0.001 to **10.000** in 0.001 unit steps. Should be set to match the Rain Gauge calibration figure for example 0.199 (mm/hr). This figure can be found marked on the Rain Gauge internal label.

Substitute Name A field available for typing in a user name between 3 to 8 characters long.

NOTE:

Once all settings have been chosen then save Edited Page Settings to MetPak RG by clicking on 'Save Settings to Device' this will change the MetPak RG configuration to reflect the new MetSet settings.

3.4.3 Monitoring MetPak RG Output Data Using HyperTerminal.

NOTE. This section describes the procedure using Windows HyperTerminal. Alternatively Gill Wind Software (http://www.gill.co.uk/main/software.html) can be used a Terminal Emulator (note Tools feature not applicable). Select the required COM port and click on OK, the required 19200 Baud Rate is already selected (or use the Baudrate drop down) then continue as from step 7.

Establishing a HyperTerminal Connection

To monitor MetPak RG data using HyperTerminal:

1. Select an available Com port and connect the MetPak RG unit.
2. Run **Hypertrm.exe (**Typically accessed via:-
   Start | All Programs | Accessories | Communications | Hyperterminal).
3. Select **New Connection** from the **File** menu.
4. Enter a name for the connection, for example *MetPak RG* and, optionally, select an icon to represent it. Click on the **OK** button.
5. In the *Connect To* dialog box, change *Connect Using* to *COMX* (where *X* is the number of the selected COM port). Click on the **OK** button.
6. In the *COMX Properties* dialog box, adjust the *Port settings* to match the MetPak RG unit's settings. The default settings are :
   - Bits per second 19200
   - Data bits 8
   - Parity None
   - Stop bits 1
   - Flow Control None
7. Click on the **OK** button.

Message Reporting

MetPak RG has two reporting modes:

- Continuous mode

In continuous mode (the default) MetPak RG reports continuously. So, if you have set up the connection correctly, you should now see data strings scrolling across the HyperTerminal window. For example:

┐ Q,262,000.04,1024.3,051.6,+023.5,+012.9,0000.000,+04.8,00,└ 62

- Polled mode

If the unit has been set to polled mode type ?Q (where Q is the unit node letter) to prompt one line of the data string. Note, allow 9.5 seconds after switching on the unit before sending a poll command.

When polled, allow 570 milli-seconds for the unit to respond with a line of data. If the MetPak RG detects a pressure/temperature/humidity sensor fault then allow 4 seconds for an error data output.

Enter SETUP MODE to check Ser. Number and Firmware Version

To enter the unit's setup mode:

- If the unit is in continuous reporting mode, type *.
- If the unit is in polled mode, type *Q (where Q is the unit node letter).

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The MetPak RG unit stops reporting sensor measurements and reporting (if in continuous mode) and responds with the following message:

SETUP MODE

The unit is now ready to receive commands.

Returning to measurement mode

To exit from the setup mode and return to the reporting mode:

Type **Q** and press **Enter**.

The MetPak RG unit returns to measurement mode and begins reporting (if set up for continuous mode).

MetPak RG commands

The following table lists the full set of commands for checking MetPak RG.

Command	Parameters	Description and examples
*****	*	Used to place the unit into a SETUP mode so that User Commands may be sent to review unit settings.
***A-Z**	*A | *Z	If the unit is in polled mode this command is used to place the unit into SETUP MODE so that User Commands may be sent to change unit settings. Where Q is the default node letter but may be set between A to Z. It is however recommended not to use letters A to F as these characters can appear in the checksum in the data string.
?A-?Z	?A to ?Z	?A – ?Z Retrieves a line of data from a MetPak RG set for Polled mode with a Node identifier set to A to Z.
EXIT		Used to change the unit from Configuration mode to Measurement mode (alternatively type Q or QUIT)
Q or QUIT		Used to change the unit from Configuration mode to Measurement mode (see also EXIT)
SERIAL		Used to report the MetPak RG serial number. e.g. 11270001
SWVER		Returns MetPak RG Firmware version e.g. SWVER = 2436 V2.01

Table 10 MetPak RG Commands

MetPak RG

Polling for Data

The MetPak unit must be set for Message Mode Poll using MetSet software (Comms Page).

A line of data will be output upon receipt of a ? followed by the Node ID (default Q).

It is recommended not to use letters A to F as these characters can appear in the checksum in the data string.

Notes:-

In Polled mode the unit MUST be allowed 9.5 seconds after switch on to be operational before the ? and Node letter are used to enable polling or it will be missed.

When in polled mode, when data is requested allow 570 milli-seconds for the unit to respond with a line of data.

If the MetPak RG detects a pressure/temperature/humidity sensor fault then allow 4 seconds for an error data output.

Polled mode can only be used for point to point communications; it is not possible to network units on to a common bus (except in SDI-12 mode).

3.4.4 Configuring MetPak RG for SDI-12

To configure a MetPak RG unit for SDI-12:

1. Connect a MetPak RG to a PC as described in Para 2.2.4.
2. Open MetSet as described on Page 33.
3. Click on the Edit Comms page and select SDI-12 from the drop down menu.
4. Click on Save Settings to Device on the Online Mode Menu.
5. Power down the MetPak RG unit.
6. Change the hardware connections for SDI-12.
7. Power up the MetPak RG unit.

3.4.5 SDI-12 Commands

SDI-12 Command Summary

- ?! Unit Address (default is 0).
- aAb! Change unit address (a = 0).
- aM! Wind Direction/Speed (direction in Degrees, speed in Metres/Sec), Temperature (degrees C), Pressure (Hecto Pascals/millibars) and Humidity (%).
- aM1! Wind Direction/Speed (direction in Degrees, speed in Metres/Sec), Temperature (degrees C), Pressure (Hecto Pascals/millibars) and Dewpoint (degrees C).
- aM2! Wind Direction/Speed (direction in Degrees, speed in Metres/Sec) and a 2 digit Wind only Status Codes.
- aM3! Temperature (degrees C), Pressure (Hecto Pascals/millibars), Dewpoint (Degrees C) and full MetPak RG Status Codes .
- aM4! Pressure (Hecto Pascals/millibars).
- aM5! Not applicable.
- aM6! Not applicable.
- am7! Not applicable.
- aM8! Digital Input 1 (Rain Gauge Input).
- aM9! Power Supply Voltage (Volts).
- aD0! Request a line of the above data.

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SDI-12 Commands with CRC

- aMC! Wind Direction/Speed (direction in Degrees, speed in Metres/Sec), Temperature (degrees C), Pressure (Hecto Pascals/millibars), Humidity (%) and CRC.
- aMC1! Wind Direction/Speed (direction in Degrees, speed in Metres/Sec), Temperature (degrees C), Pressure (Hecto Pascals/millibars), Dewpoint (degrees C) and CRC.
- aMC2! Wind Direction/Speed (direction in Degrees, speed in Metres/Sec), a 2 digit Status Code and CRC.
- aMC3! Temperature (degrees C), Pressure (Hecto Pascals/millibars), Dewpoint (Degrees C) and CRC.
- aMC4! Pressure (Hecto Pascals/millibars) and CRC.
- aMC5! To aMC7! Not applicable.
- aMC8! Digital Input 1 (Rain Gauge) and CRC.
- aMC9! Power Supply Voltage (Volts) and CRC.
- aD0! Request a line of the above data.

SDI-12 Command Details

Command	Description	Response	Example
?!	Unit Address	a<CR><LF>	0<CR><LF>
aAb!	Change the unit address a = 0, the default. b = the new address.	b<CR><LF>	1<CR><LF>
aM!	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec), Temperature (degrees-C), Pressure (Hecto Pascals/millibars) and Humidity.	atttn<CR><LF> a is unit identifier. ttt is time in seconds. n is number of data values. Measurement command to retrieve a reading of the maximum time the MetPak RG will take to complete a measurement, have data ready and the number of data values.	00055<CR><LF> 0 is unit identifier. 005 is 5 sec. measurement. 5 is the number of data readings (Direction, Speed, Temperature, Pressure and Humidity).
0D0!	Retrieve a line of the above data.	a<dir><mag><temp><pressure><humidity><CR><LF>	0+220+000.01+021.6+1013.0+041.9<CR><LF>
aM1!	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec), Temperature (degrees C), Pressure (Hecto Pascals/millibars) and Dewpoint (degrees C).	atttn<CR><LF>	00055<CR><LF>
0D0!	Retrieve a line of the above data.	a<dir><mag><temp><pressure><dewpoint><CR><LF	0+357+000.03+021.6+1013.0+008.0<CR><LF>

aM2!	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec) and a 2 digit Wind only Status Code.	atttn<CR><LF>	00053<CR><LF>
0D0!	Retrieve a line of the above data.	a<dir><mag><status><CR><LF>	0+029+000.01+00<CR><LF>
aM3!	Temperature (degrees C), Humidity (%), Dewpoint (Degrees C) and Full Sensor Status Codes.	atttn<CR><LF>	00054<CR><LF>
0D0!	Retrieve a line of the above data.	a<temp><humidity><dewpoint>< CR><LF	0+021.6+041.0+007.8+00 <CR><LF>
aM4!	Pressure (Hecto Pascals/millibars).	atttn<CR><LF>	00051<CR><LF>
0D0!	Retrieve a line of the above data.	a<pressure><CR><LF>	0+1013.0<CR><LF>
AM8!	Digital Input 1.	atttn<CR><LF>	00051<CR><LF>
0D0!	Retrieve a line of the above data.	a<dig1><CR><LF>	0+0408.000<CR><LF>
aM9!	Power Voltage (Volts)	atttn<CR><LF>	00011<CR><LF>
0D0!	Retrieve a line of the above data.	a<voltage><CR><LF>	0+12.5<CR><LF>

CRC Commands

Command	Description	Response	Example
aMC!	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec), Temperature (degrees-C), Pressure (Hecto Pascals/millibars) Humidity (%) and CRC.	atttn<CR><LF> a is unit identifier. ttt is time in seconds. n is number of data values. Measurement command to retrieve a reading of the maximum time the MetPak RG will take to complete a measurement, have data ready and the number of data values.	00056<CR><LF> 0 is unit identifier. 005 is 5 sec. measurement. 6 is the number of data readings (Direction, Speed, Temperature, Pressure, Humidity and CRC).
0D0!	Retrieve a line of the above data.	a<dir><mag><temp><pressure> <humidity><CRC><CR><LF>	0+139+000.06+022.2+1017.8 +042.7+00BIQ<CR><LF>
aMC1!	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec), Temperature (degrees C), Pressure (Hecto Pascals/millibars), Dewpoint (degrees C) and CRC.	atttn<CR><LF>	00056<CR><LF>
0D0!	Retrieve a line of the above data.	a<dir><mag><temp><pressure> <dewpoint><CRC><CR><LF	0+140+000.06+022.2+1017.7 +009.0+00D{Z<CR><LF>

aMC2!	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec), a 2 digit Status Code and CRC.	atttn<CR><LF>	00053<CR><LF>
0D0!	Retrieve a line of the above data.	a<dir><mag><status><CRC><CR><LF>	0+098+000.04+00@sh<CR><LF>
aMC3!	Temperature (degrees C), Humidity (%), Dewpoint (Degrees C) and CRC.	atttn<CR><LF>	00053<CR><LF>
0D0!	Retrieve a line of the above data.	a<temp><humidity><dewpoint><CRC><CR><LF	0+022.2+042.7+009.0LV{<CR><LF>
aMC4!	Pressure (Hecto Pascals/millibars) and CRC.	atttn<CR><LF>	00051<CR><LF>
0D0!	Retrieve a line of the above data.	a<pressure><CRC><CR><LF>	0+1017.8GM <CR><LF>
aMC8!	Digital Input 1 and CRC.	atttn<CR><LF>	00051<CR><LF>
0D0!	Retrieve a line of the above data.	a<dig1><CRC><CR><LF>	0+0000.000EgO<CR><LF>
aMC9!	Power Voltage (Volts) and CRC	atttn<CR><LF>	00011<CR><LF>
0D0!	Retrieve a line of the above data.	a<voltage><CRC><CR><LF>	0+12.2K@R<CR><LF>

3.4.6 Safe Mode

Summary

The MetPak RG Safe Mode provides a means of recovering communication with the MetPak RG whatever configuration setting may have been made. For instance if the unit has been set for SDI-12 operation Safe Mode can be used to change the communication option back to RS232 or RS422.

Connection

Connect the MetPak RG for RS232 communication as detailed on Page 11, Fig. 6.

Method

Note at this stage the MetPak RG supply to be switched off.

Open a Terminal program e.g. Gill WIND Software (http://www.gill.co.uk/main/software.html) or Windows HyperTerminal

Note if using Gill Wind Software that the Tools features are not applicable.

Open Gill Wind Software.

Serial Port: Set the drop down menu to the required COM Port Connection.

Click on the **OK** button.

Baudrate: Set the drop down menu to **4800** Bauds.

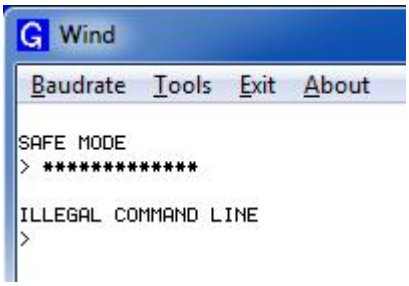
A blank Wind Terminal screen will be opened.

Hold down the * key on the keypad.

With the * key still held down, apply power to the MetPak RG.

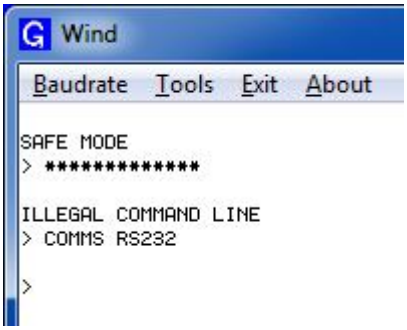
This will result in placing the unit into SAFE MODE.

Press Enter to start a new line (Ignore illegal command line).



To now change communication from SDI-12 to RS232.

Type COMMS RS232 and press Enter.



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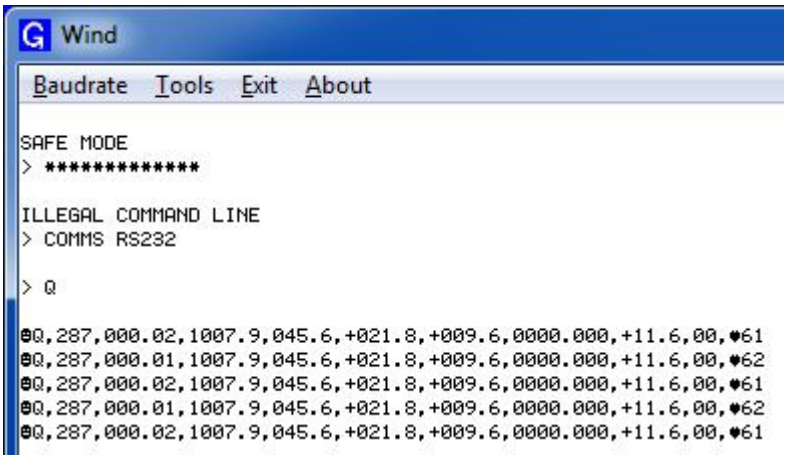
Type Q and press Enter to exit SAFE MODE.

Data will now scroll on screen.

Note however for RS232 changes to take place the unit must be powered down and back up again.



Close the 4800 baud rate Wind or HyperTerminal Program.

Power down the MetPak RG and re-apply power.

Open a new Wind or HyperTerminal program at **19200 baud** rate.

RS232 data will now scroll on screen at the MetPak RG default 19200-baud rate**.**

The * command can now be used if required to place the unit into SETUP mode and make any other changes to the MetPak RG configuration.

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4. Troubleshooting

4.1 Fault-Finding

Table 11 Common problems and their solution

Symptom	Solution
No output	Check DC power to MetPak RG, cable and connections. Check communications settings of the MetPak RG and host system match, including correct Com port. Check that the unit is in Continuous mode. Check that in-line communication devices are wired correctly. NOTE: It is usual for Anemometer TX + to be connected to converter device RX +. If appropriate use Safe Mode to attempt to obtain communication with the MetPak RG.
Corrupted output	Check that the communication settings of the MetPak RG and host system match. Try a slower baud rate. Check cable lengths and type of cable.
One way communication	Check that the wiring is in accordance with the manual.
Unexpected Temperature /Dewpoint readings	Check that the Temperature and Dewpoint units of measure (C, F, K) settings are correct on power up.
Unexpected Wind readings	Check that the Wind Sensor units of measure (m/s, knots, kph, ft/min, mph) settings are correct on power up.
Unexpected Temperature/Dewpoint and Humidity readings	Check that the HygroClip filter is clean.
Unexpected Barometer Readings	Check that the Hub Box Gortex filter is not blocked.
Status code not 00	See Table 12
Unexpected Rainfall readings or no readings when raining.	Check that the funnel and filter are not clogged and are clean. Check that the tipping bucket mechanism swings freely.

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Table 12 Status codes as output with the MetPak RG data string

Code	Status	Condition
00	OK	No fault conditions detected in measurement period.
01	Wind Sensor Axis 1 failed	U Axis blocked or faulty.
02	Wind Sensor Axis 2 failed	V Axis blocked or faulty.
04	Wind Sensor Axis 1 and 2 failed	U and V axis blocked or faulty.
08	Wind Sensor NVM error	Non Volatile Memory checksum failed, data could be uncalibrated.
09	Wind Sensor ROM error	Read Only Memory checksum failed, data could be uncalibrated.
0B	Wind Sensor reading failed.	Wind Sensor faulty.
10	Hygroclip error	Hygroclip faulty.
20	Dewpoint error	Hub Pec faulty.
40	Humidity error	Hygroclip faulty.
66	Wind Sensor Power	Check Wind Sensor is powered
67	Wind Sensor RS232 Communications	Check Wind Sensor RS232 wiring
80	Pressure Sensor Warning	Pressure sensor reading not available/unit faulty.
XX	More than one fault	Fault condition that can be the sum of 0B,10, 20 or 40. e.g. 1B would mean that both the Wind Sensor (0B) and Hygroclip (10) were faulty.

4.2 Servicing

In the event of failure, prior to returning to an authorised Gill distributor it is recommended that:

- All cables and connectors are checked for continuity, bad contact, corrosion etc.
- A bench test is carried out as described in the next section.

Contact your supplier if a fault persists.

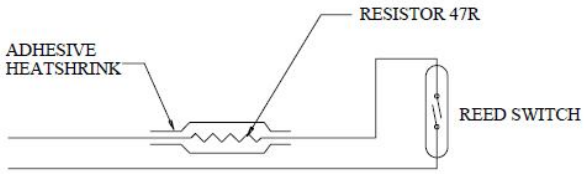
4.3 Bench Tests

Carry out MetPak RG bench test as follows:

1. Connect the MetPak RG unit to the host PC and power supply, using a known working test cable.
2. Check that the unit is correctly configured by going into Set Up mode (see page 40).
3. Check for normal output data, and that the Status Code is OK – 00.
4. If the status code is other than 00, refer to Table 12 for a list of status (error) codes.
5. Use an office fan or similar to check that the unit is sensing wind, turning the unit to simulate changing wind direction and to check that both axes are functioning.
6. Check for output changes in temperature and relative humidity sensor (the fan will also cause small changes in these properties).

Carry out Rain Gauge tests as follows:

1. Connect a DMM to measure resistance between the 6 Metre cable clear and black wire connections.
2. If the unit is assembled slowly pour in water to see make and break connections and momentary readings (of 47 ohms) in each tip direction.
3. If the unit is disassembled gently move the tipping bucket arm to the upright position and read the DMM resistance between the clear and black contact wires is close to 47 ohms. As the arm moves away from the upright position to a rest position in either direction the resistance should change to Greater than 1M ohms (open circuit).



5. Maintenance

5.1 Wind Sensor (WindSonic)

If there is any build-up of deposits on the unit, it should be gently cleaned with a cloth, moistened with soft detergent. Solvents should not be used, and care should be taken to avoid scratching any surfaces. The unit must be allowed to defrost naturally after being exposed to snow or icy conditions, do NOT attempt to remove ice or snow with a tool.

There are no moving parts or user-serviceable parts requiring routine maintenance.

Opening the unit or breaking the security seal will void the warranty and the calibration.

5.2 UV Shield (RM Young Model 41003)

If there is any build-up of deposits on the unit, it should be gently cleaned with a cloth, moistened with soft detergent. Solvents should not be used, and care should be taken to avoid scratching any surfaces. The unit must be allowed to defrost naturally after being exposed to snow or icy conditions, do NOT attempt to remove ice or snow with a tool.

5.3 HygroClip for Temperature, Humidity and Dewpoint (Rotronic Model HC2-S3)

For extreme environments such as maritime installations, chemical plants or other areas of high pollution or contamination, Gill highly recommend replacement of the temperature and humidity probe filter every 6 months to ensure proper performance.
Corroded, discoloured or clogged dust filters should be replaced.

If the filter is not replaced it is very likely you will see elevated humidity levels with time and if this is allowed to develop for a longer period of time it can lead to permanent damage on the electronics of the temperature probe due to the very high moisture content and corrosive effect of the pollutant or salt.

<u>Rotronic Temperature and Humidity filter replacement:</u>

The Rotronics polycarbonate dust filter screw-on cap is available from:-
Gill Instruments Part Number 1723-PK-025 (2 filters).
Rotronic Part Number NSP-PCW-PE (1 filter).
If you need to replace the dust filter cap, carefully unscrew it and withdraw carefully avoiding contact with the Temperature and Humidity circuit board. When re-fitting the filter cap, ensure the circuit board connections are not bent.

Consideration should be given to an annual calibration check of the HygroClip sensor by the manufacturer.

If you are replacing the whole cartridge, unscrew the metal ferrule and return the probe to Rotronic for calibration. Refer to the Rotronic Website for more details:

http://www.rotronic-humidity.com/content/meta/kontakt.php

NOTE. If you return the sensor to a HygroClip supplier for exchange, please request that the return unit has the dewpoint feature enabled.

5.4 Barometer (on Hub PCB)

The Barometer device is maintenance-free, however, if required observe the following with regard to the central Hub box screw cap Gore-Tex® filter.

Pressure Sensor Filter Replacement:

There is a small venting filter for the pressure sensor of the MetPak located on the 'Hub' box lid which ensures proper conditions are present in the MetPak 'hub' box for pressure measurements without allowing any moisture or other damaging pollutants into the box.
This filter is made from Gore-Tex® material and is designed to last a long time without replacement, however, Gill do recommend that this filter is replaced every 24 months to ensure proper operation of the pressure sensor and to keep the electronics inside the 'hub' box dry.

If you do not replace the filter every 24 months you may start to see elevated or erroneous readings of the pressure sensor with time and this behaviour can be corrected by replacement of the Gore-Tex® filter unit.
The Gore-Tex® filter kit is available from:-

Gill Instruments Part Number 1723-PK-024.

To replace the filter, unscrew the 4 screws retaining the hub box lid. Remove the existing Gore-Tex filter and M12 Nut. Fit and secure the new filter with the nut provided. Re-fit the 4 lid screws.

Should you be uncertain as to how often you should be replacing the filters for your application or if you wish to discuss this in more detail please contact Gill support and we will be able to provide a recommendation for you.

5.5 Rain Gauge

Maintenance periods are site dependant but periodic maintenance every 2-3 months should be considered.

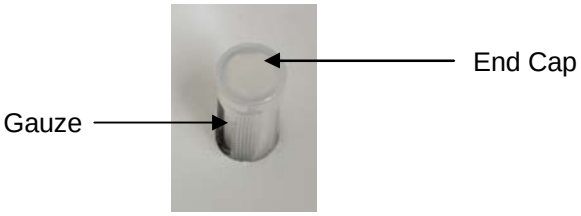
To ensure reliable and accurate measurements, we recommend that the following checks are carried out at each visit to the rain gauge.

Please note that if the gauge is still connected to a data logger, and logger is operating care must be taken to avoid tipping the bucket when carrying out the following operations.

1. Inspect the funnel and filter for any damage or blockage. At certain times of the year leaves may have accumulated in the funnel, dirt and dust can also block the filter preventing or reducing the flow rate to a slow drip to the buckets beneath. The leaves can easily be removed from the funnel.

2. Unscrew the 3 nylon screws securing the funnel to the case assembly and remove the funnel.

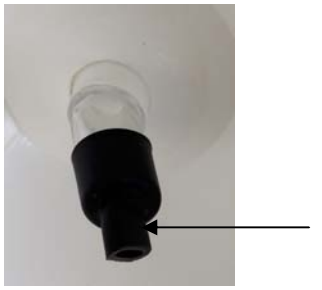
3. Remove the end cap from the filter tube; remove the gauze filter material carefully.



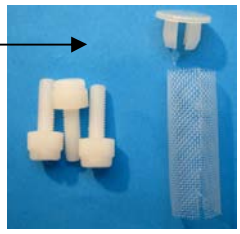
4. The external plastic funnel surface should be cleaned with clean water and a sponge; this will generally remove any green Verdi Gris should this have been allowed to grow.

5. Chemicals/detergents should not be used if the water is to be collected for later analysis. Otherwise mild detergents can be used if required.

6. The internal funnel tube that directs water to the tipping buckets may need cleaning, use a pipe cleaner or small nylon bristle wire brush or similar part to insert into the pipe to clean it

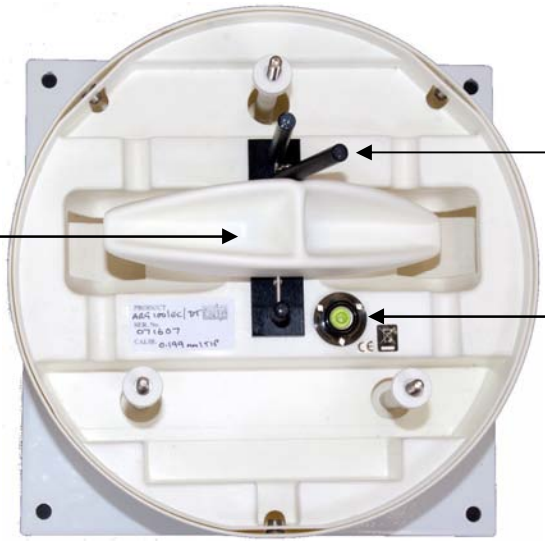


Funnel Filter Kit →



7. Clean or replace the gauze filter into the filter tube and replace the top cap (see spare part 1723-PK-114).

8. Remove and clean any dirt from the tipping buckets, being careful not to tip the bucket should the rain gauge still be logging.

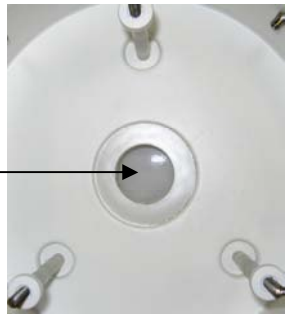


9. Check that the gauge is still level. It is possible for the gauge to become tilted as a result of small ground movements, vandalism etc.

10. There will be times when for one reason or another the rain gauge will be not logging or will be disconnected from the logger, during these times it is a good idea to check the balance arm of the bucket for stiffness. The easiest way to do this in the field is to try and balance the bucket in its centre position, it should be very difficult if not impossible to achieve this, if the bucket balances easily then examine the bucket closely for any dirt or wear on the pivot pin and bucket tubes. Any wear will require the unit to be repaired/replaced.

11. There is a drain hole at the base of the instrument with a gauze covering that might require periodic cleaning. Carefully lift out the tipping bucket assembly to gain access to the drain hole for checking/cleaning.

Drain Hole Gauze



12. Carefully re-assemble the Rain gauge parts. When assembling the funnel to the base assembly check that the internal funnel does not foul onto the tipping bucket. This can be checked by pouring in water and checking the bucket tips or if the whole assembly is not fixed in position by gently rocking the bucket and listening for the bucket to tip.

13. Internal parts require no lubrication.

NOTES

MetPak RG is supplied with a matching Rain Gauge and its tip calibration factors will have been pre-programmed into the MetPak hub box. If a replacement or re-calibrated Rain Gauge is used then the Hub box will need programming using MetSet with the new tip calibration factor if this has changed.

Calibration figures can be seen on the labels inside the Rain Gauge on the underneath of the bucket and adjacent to the tip assembly.

5.6 Spare Parts

MetPak RG

1723-10-051	RS232 to USB 1.8M configuration cable.
1723-PK-024	Pressure Sensor Filter Spares kit.
1723-PK-025	Hygroclip Filter Replacement Kit (2 Filters).
1723-PK-076	Aerodynamic Rain Gauge (ARG100/EC (GI).

Rain Gauge

Tipping Bucket Spares Part 1723-PK-114 comprises of:-

3 off nylon screws to retain the bucket to the base assembly.
2 off funnel gauze filters.
2 off funnel gauze retainer top caps.

5.7 Returning the MetPak RG

If a unit has to be returned, it should be carefully packed in the original packaging and returned to your authorised Gill distributor, with a full description of the fault condition. An RMA number should be obtained from Gill Instruments first if returning directly to Gill Instruments.

6. Technical Information

6.1 Specification

Wind Measurement	
Parameters	Polar Wind Speed & Direction or U and V Vectors
Units of Measurement	m/s, knots, mph, kph, ft/min

Wind Speed	
Range	0-60m/s (0-134mph)
Accuracy	± 2% @12m/s
Resolution	0.01m/s (0.02mph)
Threshold	0.01m/s (0.02mph)

Wind Direction	
Range	0-359 Degrees – No dead band
Accuracy	± 3°@12m/s
Resolution	1°

Air Temperature	
Type	Pt100 1/3 Class B
Range	-35°C to + 70°C
Accuracy	±0.1°C
Resolution	0.1°C (0.1°F)
Units of Measure	°C or °F

Relative Humidity	
Range	0-100%
Accuracy	±0.8%@23°C
Resolution	0.1%
Units of Measure	% RH

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Dew Point	
Resolution	0.1°C (0.1°F)
Accuracy	±0.15°C (23°C ambient temp @20°C dew point)
Units of Measure	°C or °F

Barometric Pressure	
Range	600 to 1100hPa
Accuracy	±0.5hPa
Resolution	0.1hPa
Units of Measure	hPa, mbar, mmHg, InHg
Compensated for Temperature dependency –20°C to +70°C	

Precipitation (Rain Gauge)	
Range	Effectively Unlimited, tested to 1000mm/hr
Accuracy	±2%
Resolution	0.2mm
Units of Measure	Millimetres per tip

Inputs	
Digital Input (Rain Gauge)	Contact Closure input (tipping bucket rain gauge) capable of capturing events up to 10Hz
Digital Input	Capable of detecting an event with a duration of greater than 1.4mS.
Digital Input	Capable of detecting a space between events (i.e. terminals open-circuit) with a duration of greater than 11mS.
Digital Input	Capable of reading a switch contact closure providing the total Digital Switch contact resistance (contact and cabling) is less than 1k ohm.

Outputs	
Digital Outputs	RS232, RS422 RS485***** or SDI-12
Baud Rates	1200 (SDI-12), 4800-57600 (ASCII RS232, RS422,RS485*)
Protocols	ASCII or SDI-12 V1.3
Data Output	0.25, 0.5, 1 Hz or Polled Mode.
MetPak RG Status	Status codes provided within the data message string
***** RS485 2 wire point to point only.	

Power Supply	
Input voltage (RS232, RS422, RS485)	4.5v to 30v dc
Current	26mA at 12v (default setting)
Input voltage (SDI-12)	9.6v to 16v dc (12v nominal)
Current	12mA
MetPak Environmental (Excluding Rain Gauge)	
Protection Class	IP65
EMC	EN 61326
Operating Temperature	-35°C to +70°C
Storage Temperature	-40°C to +80°C
Operating Humidity	0% to 100% Humidity
MetPak Mechanical (Excluding Rain Gauge)	
External Construction	UV Stabilised white thermoplastic (Wind Sensor and Hygroclip Mountings) and anodised Aluminium Bracket.
Fittings	Stainless Steel 316 bracket fittings supplied for clamping to a vertical pipe of diameter 30mm to 58mm.
Overall Dimensions	350mm x 287mm x 142mm (excluding bracket clamp)
Weight	2.1kg (including bracket)
Software	
MetView Display	Free Software providing the means of displaying data and logging data
MetSet Configuration	Free Software providing the means of configuration of the MetPak RG
Rain Gauge Mechanical	
External Construction	UV Resistant white thermoplastic
Fittings	Rain Gauge Baseplate (RGB1) and 6 Metres of twisted pair overall screened cable.
Overall Dimensions	Funnel Diameter: 254mm (10.0 Inches) Funnel Rim: 340mm (13.4 Inches)
Weight	1.0kg
Rain Gauge Environment	
Protection Class	Not applicable
EMC	EN 61326
Operating Temperature	+35°C to +70°C
Storage Temperature	-40°C to +80°C
Operating Humidity	0% to 100% Humidity

6.2 MetPak RG Hub PCB Connections

The following tables summarise the connections for:

- HygroClip (factory connection)
- WindSonic anemometer (factory connection)
- RS232/RS422/RS485/SDI-12 communications (User connection)
- Digital Input (user connection)

Connection details are also found within the MetPak RG Hub box.

Factory Connections

Table 13 HygroClip connections (6-way connector J1)

Connector J1	Wire Colour	Signal Name
1	-	No Connection
2	Blue	RXD from HygroClip UART
3	Red	TXD to HygroClip UART
4	Yellow	Analogue 0V (Not Used)
5	Grey	Supply/Signal 0V
6	Green	Supply +ve (+3.3V DC)

Table 14 WindSonic anemometer connections (8-way connector J4)

Connector J4	Wire Colour	Signal Name
1	-	No Connection
2	-	No Connection
3	Blue	RS232 TX+ Anemometer Output to Hub
4	White	RS232 RX+ Hub Output to Anemometer
5	Green	Signal 0v
6	Yellow	Supply 0v
7	-	No Connection
8	Red	Supply +ve (4.5v to 30V dc)

User Connections

Table 15 PC communications (8-way connector, J5)

Connector J5	Signal Name
1	SDI-12 TX/RX
2	Signal 0V
3	**RS232 TX-**, (or RS422/RS485 TX-) HUB to user
4	**RS232 RX-**, (or RS422 RX-) User to HUB
5	RS422 RX+, User to HUB
6	RS422/RS485 TX+, HUB to User
7	**Supply 0v**
8	**Supply +ve (4.5v to 30v dc)**

Table 16 Digital Switch Input (2-way connector, J8)

Connector J8	Signal Name
2	DIG1 (Digital Switch Contact Input)
1	GND (Ground)

6.3 Electrical Conformity Certificate

EC DECLARATION OF CONFORMITY ACCORDING TO COUNCIL DIRECTIVE 2004/108/EC

We, Gill Instruments Ltd., declare under our sole responsibility that the products:

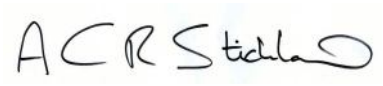
MetPak RG Weather Station

Manufactured by: Gill Instruments Ltd

to which this declaration relates, are in conformity with the protection requirements of Council Directive 2004/108/EC on the approximation of the laws relating to electromagnetic compatibility.

This Declaration of Conformity is based upon compliance of the product with the following harmonised standards:

Emissions	EN61326
Immunity	EN61326 (excludes 150khz to 250khz)

Signed by: 

A.C.R. Stickland – Director

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